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Boeshore, Jay F.
A history of Magnet Wire

Local History
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"A HISTORY OF MAGNET WIRE"
Its Influence in The Community of Fort Wayne,
And the Founding of The REA MAGNET WIRE COMPANY, Inc.

by

Joy F. Hoshore

The Directors of the Rea Magnet Wire Company, Inc., during 1964 and during previous years, expressed the desire for having a history of Magnet Wire prior to June 27, 1933, at which time the Rea Magnet Wire Company, Inc. was incorporated in Fort Wayne, Indiana, and some of the factors that led to the founding and development of the Company and the effect of the Magnet Wire Industry in the Fort Wayne community. It was their thought that such a history would be of great interest, not only to the present officers of the Company, but also to those who will succeed them. The writer was the person directed to execute some form of a historical record.

Before relating the origin of magnet wire, we should have some knowledge of the basic element of magnet wire, which is bare copper wire and is generally produced from electrolytic copper, although the bare wire may be made from many other metals, alloys, and copperclads. The round shapes are generally used, however, many shapes are common, such as flats, squares, rectangulars, ovals, etc.

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Persons not associated with the wire industry have the impression that wire is produced by a stretching process. Wires, as they are formed and drawn, are elongated from one

larger Brown & Sharpe gauge to the next succeeding smaller Brown & Sharpe gauge to approximately 26% increase in footage or a reduction in circular mil area of approximately 20.9%. A circular mil is a circle having a diameter of 1/1000 of an inch.

The Brown & Sharpe gauge, known as the B & S gauge, follows a true geometrical progession or ratio. The size of magnet wire is usually expressed in the B & S gauge. It is a matter of convenience, because standard reductions follow the B & S gauge and non-slip drawing machines are built along these line. There are other gauges especially for steel wire, and foreign gauges that are expressed in the metric system. The B & S gauge is the logical outgrowth of wire drawing practice, and it has largely supplanted other gauges in the United States and Canada.

"Wire" has been defined by the Bureau of Standards as "a slender rod or filament of drawn metal". In the definition the word "slender" is used in the sense that the length is great in comparison with the diameter.

The term"Magnet Wire" can be defined as an electrical conductor that can be used in the winding of electromagnets, but in industry it is generally understood to mean round, copper wire covered or coated with thin wrappings of silk, cotton, paper, organic and inorganic fibers, and organic, fossil, oleo and synthetic resins.

It is hardly a mis-statement to state that Magnet Wire is an outgrowth or development of the bare wire industry. To

try to enumerate the uses and applications for bare wire would be an enormous task.

During the drawing of wire, the cross-sectional area is reduced. This results in increased footage of the wire and is brought about by the fact that the frictional resistance of the entire wire and the die, holds back the surface of the wire and allows the center core to pass on. This forms a kneading action of the copper similar to the hand kneading operation for making pastry products. Wire drawing has also been defined as reducing material to a section corresponding to the outlet orifice of the die, and elongated proportionally to section reduction, through the influence of drawing stresses operating longitudenally, and by pressure exerted laterally throught the die wall.

Today, wire, whether magnet or otherwise is tremendously important and essential in our social, industrial, economic, and military lives. Visualize if you can, the state of inconvenience, suffering, chaos, and retrogression that would immediately exist if all forms of wire were suddenly taken away from us. Let us pause to mention a few of the uses we would be deprived of, such as: lights, radios, television sets, telephones, electric power, motors, trucks, airplanes, automobiles, window screens, bed springs, clocks, wire nails, needles, wire used in carding fibers for yarns, electric fans, mattresses, refrigerators, heating, and thousands of other electrical gadgets and controls.

It is believed that approximately 5000 years ago the indispensable tool, the drawing die, consisted of a hard wood plate, suitably bored, later of drilled stones, then of bored plates of steel and today of heat and pressure-cindered metallic carbides (such as tungsten) dies, and drilled diamonds.

The origin and very early history of wire is very meager and was unrecorded, but from fragmentary evidence, it appears first to have come into use for ornamentation of persons of celebrity. The early forms of wire were, of course, very primitive, and the making of them was by very crude methods. It has, however, been recorded, upon discovery of the Queen Shubab of Samaria, that it was observed she had heavy rings of gold wire twisted in her wig. Also a necklace found in Egypt, bearing the name of a pharaoh and reigning in probably 2750 B.C., consisted partially of gold wire.

If we can consider the Bible factually, there is a reference to wire in Exodus, Chapter XXXIX, Verse III, that reads as follows: "And they did beat the gold into thin plates, and cut it into wires, to work it in the blue and in the purple, and in the scarlet, and in the fine linen, with a cunning work". Whether mere words gives us the correct interpretation of the above verse is beyond our knowledge, but it may be an indication that they had metallic strands of some kind.

There is authentic evidence that Assyria and Babylon made use of wire in 1700 B.C. Homer, a Greek poet, and Pliny a Roman writer, made reference to wire woven or embroidered

into golden textiles. By the period of 800 B.C. new uses of wire were found. A piece of wire rope made during this period was found. The wires were bunched parallelly and then bound together with stout bands of wrought iron. A piece of bronze wire rope was excavated from the ruins of Pompeii and was made by twisting together three strands of wire. Later craftsmen began to adapt wire to the making of armor, weapons, wire, rings, bracelets, links, etc. As late as three centuries ago, wire may have again entered the adornment field in the form of tinsel in India. The strands of silver were hammered out by hand and used to decorate or drape over the elephants during religious ceremonies.

From the foregoing, it can be observed that the specimens of wire were produced from non-ferrous metals such as copper, silver, gold, and their primitive alloys. These metals lend themselves to easy working hot or cold and could be the reason for their selection for ornamental purposes. Specimens of iron wire have not been recorded, but it is only reasonable to assume that they did not overlook the potential physical properties of iron wire. However, specimens might have been found if it were not for the fact that due to hydrolysis, iron wire will deteriorate faster than the non-ferrous metals.

During these very early years wire existed only in short lengths; not more than a few inches. The specimens that were found were not produced with dies, but examination revealed

that they were sheared from plates or sheets and rounded by beating with some tool. Those from thin sheets were rounded into tight scrolls. There is no evidence that the wires were produced by any form of elongation.

To follow the chronological history of wire drawing during the last 1000 years would consume considerable time, but it can be assumed that progress was extremely slow. However, it is fairly well established that the early development of wire drawing was conducted in the city of Nuremburg, Germany.

During the early development of wire drawing, power machines for drawing were unknown. After mechanical machines came into use, iron wire was used extensively for wool cards, fish hooks, mouse traps, etc.

An amusing episode occured during the early drawing of steel wire. The story is related of a German wire drawer, who became very angry and disgusted with a troublesome batch of steel wire, so during his rage, he tossed the wire through a shop window; it landed in marshy soil in the rear of a privy. Sometime later, the owner discovered it at which time it had been coated with a brown scum. The owner felt a punishment was in order, and the drawer was ordered to draw it as it had been found. To the surprise of everyone, the wire drew beautifully, due to the sull coat on the wire. From this the coating of steel wire, prior to drawing, became a great secret and was guarded for 100 years.

During this period, wives and children of wire drawers would go to the mills at noon carrying yokes over their

shoulders, one end bearing a lunch bucket, and the other a bucket containing the family contribution to the art of sull coating. After 100 years of experimenting with coatings, it was found that dilute sour beer would produce a satisfactory sull coating.

From the foregoing it can be easily assumed that decorative wire in some manner may have played a part in the very early development of magnet wire. It is difficult to establish when cotton and silk covered wire was developed and applied for general usage. It is known that covered wire was manufactured in Philadelphia in 1820 by a company under the name of "Moore" for use in the framing of bonnets that were worn by the ladies at this time. According to tradition, Professor Morse, during his experiments in telegraphy, came to Philadelphia, and engaged the Moore Company to cover the wire he used in his coils. Again according to information available, Alfred F. Moore of Philadelphia, Eugene Phillips, of Providence, Connecticut, and the Ansonia Electrical Company of Ansonia, Connecticut, were the pioneers of the insulated wire industry as it is known today.

The first insulated wire was covered with cotton or silk spirally wound around the wire. The machines were made with single spindles and were rather crude. After the demand for this form of insulated wire increased, the machines had to be improved as well as the quality, and greater attention had to be paid to the evenness and uniformity of the insulating material.

More recently, substitutes for cotton and silk are used, such as rice paper, cellophane, cellolose acetate, and filaments of rayon, cellonese, glass, and nylon spun into strands multiplied parallelly and applied in the same manner as cotton and silk.

The wire industry became very active between 1900 and 1920 and it was during this period that magnet wire made great progress. Since insulating wire with cotton or silk was a rather slow operation and costly, it had the effect of stimulating the minds of insulating engineers. The logical sequence was that research and experiments were conducted with various liquids, oils and varnishes that had good dielectric properties and could be applied by a dipping process; cheapness, lower space factor, and rate of production were essential.

At the beginning of this century, the major electrical industry became very important, and the insulation of copper wire very soon played a great part. At this time, varnish insulated copper wires were unknown, and the textile covering of wire was considered satisfactory. This form of insulation produced a considerable increase in the diameter of the conductor and had the disadvantage of being hydroscopic, but for a number of years this latter difficulty was overcome by preheating the coils and impregnating them with an insulating varnish.

The beginning of the enameling art may have originated in Chicago, Illinois. The Western Electric Company in Chicago was an early experimenter in attempting to coat wire with a

black bitumen (asphalt) type of enamel. Other companies got into the game and wires were insulated with heavily bodied drying oils, such as oil of linseed and China wood oil, and others. These oils were formulated with various solvents to promote flowing, built-up, oxidation, and baking properties. Kerosene entered into practically all formulations. Shellacs and lacquers were also used to coat wires where specifications permitted. It is interesting to note that Mr. Cyril A. Soans of the Belden Manufacturing Company, Chicago, made "Belden's" first successful wire enamel in 1906, and the product was sold during the year.

The original wire enamels, no doubt, contained soft resinous materials together with probably linseed and China wood oils or some other common oils. In practice, wire made with such enamels would not withstand mechanical abuse or the solvent action of the transformer oils or varnish thinners. Wire used in dry applications was satisfactory. This weakness again promoted further research for enameled wire that would overcome solvent and abrasive weaknesses.

Prior to 1910 to 1912, black enamels based mainly on bitumen and drying oils were in general use. The oils commonly used were linseed and China wood. About 1900, China wood oil was formulated in impregnating varnishes and resulted in considerable improvement. The wood oil, in comparison with linseed oil, prossesses much better properties. Due to its chemical nature, it dries far better by oxidation and by self-polymerization through heat induction. This property

and the improvement in impregnating varnishes got the enamel manufacturers to thinking and reasoned that it might be possible to apply such an insulation directly to the copper wire. Their reasoning was proven correct and the process was applied prior to 1910, but required considerable further development. It remained basically unchanged for quite a few years, with exception of improvements in applicationg methods, and newer resins and thinners becoming available. The oil based enamels gave a high resistance to humidity, but had the drawback of poor heating resistance and weak solvent resistance.

During World War I, experiments were conducted based on high boiling point natural copals, together with wood oil. Such formulations produced ruby-red colored wire that possessed resistance to humidity, more durability, more elasticity, and better resistance to the chemical and physical action of aliphatic hydrocarbons. The technique of processing wood oil was also improved. During World War I and directly thereafter, the United States chemically woke up. From a chemical standpoint we were in a terrible state as compared to the foreign countries -- especially Germany. We were dependent on foreign countries for many simple reagents, drugs, and dyes. The fact that we were at war with Germany, made it impossible to import our needs, and common chemicals rose in price as much as 3000%; - 18 to 2000% was common. Today phenol or carbolic acid, enters very greatly in our lives as well as being used extensively in present day synthetic enamels. This commodity rose from 5 cents per pound to $2.00

per pound and became during the war period, one of the early products of the Dow Chemical Company, but their early carbolic acid was inferior to the products from Germany at 5 cents per pound. You can readily see why the United States made a rush to become chemically independent. It was realized during this war that future wars would be of a chemical nature. Those who were engaged in research problems during the war can relate many instances from personal experiences and observations.

The above diversion has been injected to convey factors that had a direct and important bearing on the future developments of synthetic enamels for magnet wire, and numerous other insulations. Due to the chemical activity, many new materials became available to the enamel manufacturers.

The following are today some of the raw materials that can be chosen:

Gums or Resins:

Resins, esther gums, Congo Esthers, bakelite, phenolic resins, ambero, kauri, Congo, Manila, Gilsonite, pitch, polyvinylacetal, polystyrene, polyethylene, silicones, superpolyamides (known under the name of Nylons), polyurethene, tereph thalic esthers (Terelene), teflon and epoxies.

Oils:

Tong or China wood, Linseed, Castor, Soybeans, Parilla, Fish Oil and Oiticica Oil.

Dryers:

Lead, manganese, cobalt, rsinates

Thinners:

Kerosene, Coal Tar and Petroleum napthas, cresylic acid, furfural saturated or polymerized hydrocarbons, pine oil, turpentine, dipentine, methyl, ethyl cellusolves.

Since the early development of magnet wire was closely associated with the city of Fort Wayne and since it became the magnet wire center of the world, it is only fitting that the story of the development and the man whose foresight and perseverance produced a great industry in Fort Wayne, should be related in some detail.

The pioneer of the Magnet Wire Industry in Fort Wayne was Mr. George A. Jacobs. He was born in Dudley, Massachusetts, on August 29, 1877. His parents were of colonial ancestry in New England. He attended public schools and was graduated from Nichols Academy after which attended Worcester Polytechnical Institute and graduated as an Electrical Engineer in the Class of 1900. After graduation he spent a year in Middlebury, Vermont, as Manager of the Middlebury Light and Power Company.

Mr. Fred S. Hunting, who was graduated in the same class at Worcester Polytechnical Institute and who became General Manager of the Fort Wayne Electric Company of Fort Wayne, in October of 1901, persuaded Mr. Jacobs to come to Fort Wayne and assist the staff of engineers needed at the time.

Mr. George A. Jacobs

1926

Founder of Dudlo Manufacturing Co.

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Mr. Jacobs remained in Fort Wayne four years, and during these four years, was associated with the activities of the General Electric Company, and with Ed Barnes, who became works manager of the General Electric, Fort Wayne Plant, and is still living in Fort Wayne at the age of 90 some years.

While in Fort Wayne from 1901 to 1905, Mr.Jacobs became more and more deeply interested in means and methods for insulating copper wire that was so badly needed for electrical devices. This shows, without a doubt, that Mr. Jacobs was one of the very early experimentors for a method of applying enamel directly to bare copper wire as a form of insulation.

Mr. Jacobs' convictions and faith in enamelled insulated wire were so strong that in 1905, he decided to leave the Fort Wayne works and entered the employ of the Sherman-Williams Company in Cleveland, Ohio, to take charge of the insulating materials. The idea for using enamel to insulate wire was never dormant in his mind, and eventually he became an expert in this field; the result was that he was appointed Manager of the Insulating Department, both in manufacturing and sales. This promotion did not deter him from continuing his investigations in this field as it applied to the whole process of application and manufacturing of magnet wire; proof of his ideas and theories now awaited experiments.

While Mr. Jacobs was in Fort Wayne, he attended Plymouth Congregational Church and became a member of the youth group. It was through these associations that he met Miss Ethel Mossman,

the younger daughter of William E. Mossman. They were married in Fort Wayne on October 9, 1907, and began housekeeping in an apartment in Cleveland. The kitchen of this apartment became the nursery or perhaps the birthplace of the Fort Wayne Magnet Wire Industry. In this kitchen, Mrs. Jacobs was a co-operator or assistant in the early experiments. A tower in the form of a 6" pipe was erected about 7 or 8 feet in height. The fuel used was the gas from the kitchen range, and the motive power was taken from the light socket in the kitchen.

By continuing experiments, the enamel and application were proven by test to be commercially possible and plausible. The use of insulated wire was growing in demand and opportunity was knocking at his door. The culmination of Mr. Jacobs' experimental work and his knowledge of insulation in 1910, led to a partnership formed between Mr. Jacobs and Messrs. William E and Paul Mossman of Fort Wayne, and a small plant was set up in Cleveland, Ohio. It was located on the third floor of a building that was located on the site of the present auditorium along the lake. The room in which the wire was enamelled was rather warm; the windows could not be kept closed during warm weather and during the Mayfly season; the Mayflies entered the room through the open windows and flew onto the wires traveling through the ovens, causing a lot of trouble and defective wire. The partnership was known as "Dudlo" in honor of Dudley, Massachusetts, his hometown and Ohio, the

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state that first claimed it as home.

While Mr. Jacobs was in Cleveland, Mr. Victor F. Rea, who will be referred to later in this story, joined Mr. Jacobs. He operated enamel machines and did shift work. Since enameling was a new industry, there were many unknowns and many problems and difficulties presented themselves that had to be overcome by experimentation before the business could be thoroughly established. During these early years, Mr. Jacobs, while employed by the Sherwin-Williams Company, made the acquaintance of Mr. P. D. George, who also was employed by Sherwin-Williams Company, although his father had been an early varnish maker and conducted a business in St. Louis which was established in 1867. Mr. Jacobs consulted and worked with Mr. P. D. George to produce a better enamel. Their combined efforts created a very stable and efficient enamel, and Mr. Jacobs felt greatly indebted to Mr. George. Mr. Jacobs never divulged the formula to any of his associates during the rest of his career. Mr. George's interest in the varnish industry induced Mr. Jacobs to have Mr. George assume the responsibility for making the insulating enamel.

After a year or more of operating on an experimental scale, ultimate success was assured, and Mr. Jacobs severed his connections with the Sherwin-Williams Company to devote all his time to the new venture. The demand for enameled wire continued to increase enormously due to the manufacture and use of automobiles and the extraordinary expansion of the

The small building pictured above still exits, but many do not know it. This is because the additions made to it have become so much larger than itself. It stands amidst a flock of other buildings; it constituted a very small portion of the Enamelling Department. It was built in 1911 and at that time Dudlo's entire business consisted of buying bare wire, enamelling it, and selling it. This little building took care of it all!

The gentleman in the picture appears to be Mr. Wm. Mossman.

Ford Motor Company.

Mrs. W. E. Mossman, Mrs. Jacobs' mother, was in ill health and Mr. W. E. Mossman pleaded with Mr. Jacobs to move the small plant to Fort Wayne. Mr. Mossman owned the properties at the western end of Wall Street, located in the angle formed by the St. Mary's River and the Pennsylvania Railroad on the north. It was a pocket of wast land at the time. Mr. Mossman suggested that the new plant be started on one of these properties.

Mr. Jacobs then decided to come to Fort Wayne and moved the plant here in October, 1911, at which time there were ten employees.

There was considerable expense involved in moving the small plant to Fort Wayne, and new capital was needed to operate the plant. Mr. Mossman loaned $50,000.00 to the new industry, but demanded that he be given promissory notes for the whole amount and large bonus of common stock. It was not long before the $50,000.00 was expended and the plant was operating in the red through 1912 and 1913; but the plant continued to run. Difficulties were overcome, the products were improved and the output was increased. All of these factors led to the rapid expansion of the plant and the notes and obligations were paid in full. Mr. Mossman retained the bonus of common stock, which in time, increased in value to over $1,000,000.00.

When the plant was moved to Fort Wayne, a sheetmetal building was erected that had a total of 2400 sq. feet of

floor space, and provided enough room for the enamelling of bare wire; this building still remains. Coils of magnet wire were wound as early as May, 1912, and were shipped mostly to the General Electric Company and The K. W. Ignition Company in Cleveland. A great deal of the wire produced was defective and a coil department was needed as an outlet for unsalable wire.

While the small plant was in Cleveland, Mr. Jacobs had very close relations with the K. W. Ignition Company of that city. Mr. J. A. Williams and two other gentlemen, a Mr. Albright and a Mr. Kaple, were a part of the K. W. Ignition Company and worked very closely with Mr. Jacobs. They permitted and aided Mr. Jacobs to experiment and run coils in their plant. They subsequently bought large quantities of coils and wire from the new industry for making spark coils for the Ford Motor Company, and when the Dudlo was re-organized in 1914, Mr. J. A. Williams and Mr. Kaple became stock holders by acquiring stock by purchase and not gratuitously. They did not become directors or act as such at any time, but were very instrumental in bringing about success to the Dudlo.

The story would not be complete if it did not relate the employment and associations of a few of the early employees after the plant was moved to Fort Wayne, and who continued to be associated with Mr. Jacobs through the 1920's and early 1930's. One such person was Miss Angela Baltes of Fort Wayne, who accepted the position of stenographer and bookkeeper. She was

employed and started to work in May, 1912. Miss Baltes was paid $35.00 per month and worked two years before she got a raise. She got a raise of $5.00 per month by telling Mr. Jacobs she merited a change in salary.

In May of 1912 there was an employment of approximately twenty-five persons. Coils were already being wound and Mr. Victor F. Rea was foreman of the Winding Department. Winders were paid $0.10 and $0.12 per hour. At this time they had six enamel machines and were able to run but four wires on one machine. As time went on the machines were progressively developed to run six, nine, twelve, fifteen, and finally thirty-two wires, double bank. Dave Voss was in cahrge of the Enameling Department and Con Voss was a shift foreman. The principal customers were still the K. W. Ignition Company and General Electric Company. The Ford Motor Company was not as yet buying coils from Dudlo.

The early months for this group were very trying and disheartening, and at times the efforts required did not seem to warrant coninuance of the venture. Orders were limited and money was running out. When Mr. Jacobs was away from the plant on trips, Mrs. Jacobs would call on the telephone each day to learn if orders had been received, while Mr. W. E. Mossman would call in person each day at the plant to ascertain if any cash was left.

The facilities for producing wire and coils was limited and when the General Electric Company of Fort Wayne started to buy coils they wanted quick delivery. Motorized trucks

were not available, and the General Electric Company would send a small German man, with a small push cart, down Wall Street to the Dudlo to pick up the coils. Due to the critical circumstances the young organization was in, economy had to be exercised to the Nth degree. Mr. Jacobs did not shun physical work; nor was he too proud to be seen doing chores around the plant. Since delivery facilities were not convenient, Mr. Jacobs personally used a small pony and cart to deliver coils to the General Electric Company, and wire to the railroad station; the pony was the property of the in-laws. During 1913, 1914 and early 1915, Mr. William Hanselman, who is at present still an employee at the Rea Magnet Wire Company, in the Payroll Division, was employed part time by the General Electric Company. At times he had to wait until the coils were dry enough to load into the push cart. One day he was approached by Mr. Warren Sweet, relative to working for Dudlo. Bill accepted and started to work for Dudlo on May 15, 1915 at $.16 per hour. He continued with Dudlo until it was shut down in February of 1933. Bill can remember selling five pounds of #14 Bare wire to Clyde Emerick for $1.00 in 1922, and still has the delivery slip.

In 1913 during the flood, the plant was in the flood area. The personnel had been notified that the plant might be affected. As a result, portable equipment and materials were placed on benches and tables and elevated positions. The record and accounting books were taken by Mr. Jacobs to his

home each day. Every day Mr. Jacobs would take time out to go into the plant and mix a new supply of enamel.

The only mechanical power available on the property was an Elyria gas engine. This was used for three years to drive the machines, and was a very troublesome piece of equipment, but had to be kept in constant operation to supply power for the enamel and winding machines. One night the engine stopped running and the men on duty were unable to get it started. On this particular night, Mr. Jacobs had a party in his home and was dressed in a tuxedo, when he was called and told the engine was not running. He instantly left the party, went to the plant, and go the engine started without taking time out to shed the tuxedo.

The afore mentioned episodes are related to show the tremendous struggle that had to be made to develop a very successful industry in Fort Wayne.

During 1913 and 1914 the Ford Motor Company placed large orders for coils with the Dudlo. These coils demanded large quantities of #38 enameled wire, and were used for the Model T Ford, for which there was a very large demand.

Progress and expansion were now taking place and in 1914 the original partnership was dissolved and the Dudlo Manufacturing Company was organized. Outside capital was admitted and the second building was erected. After 1914, expansion was so rapid that it necessitated building one or more buildings each year until the number of buildings increased to twenty-three by 1929.

In March of 1914 another faithful and conscientious employee, Mr. Wendell C. Glass, joined the organization as Master Mechanic, and continued as an associate with Mr. Jacobs until in the 1930's, at which time Mr. Jacobs decided to retire from the Magnet Wire Industry. When Mr. Glass was employed, they still had only six or eight enameling machines. The number of employees had increased to thirty-five. Mr. Victor F. Rea was superintendent of the winding department.

The gas used was generated by one gas producer and during the year three more producers were started. The gas producers were a continual source of trouble, but had to be operated to supply fuel for the ovens. The flow and quality of the gas could not be controlled and these features were reflected in the quality of the wire. To illustrate again the efforts that had to be put forth at all times, one week-end a bar or rod holding up the grates over the ash pit of one of the gas producers, in some manner became dislodged. The ashes could not be removed. Men on duty were unable to straighten out the trouble. Mr. Glass was called at night and had to report to the plant to get the producer in operation. He proceeded in some manner to crawl in underneath the ash pit and put the rod in place. While he was in the pit, a rope was tied around his ankle so he could be pulled out if anything went amiss.

Mr. C. V. Scott, who is at the present time Plant Enginneer of Rea Magnet Wire, was hired by Dudlo in December, 1915. He

had previously been employed by the City Gas Company and due to this experience, he was put in charge of the gas producers. One day Mr. Glass approached him and gave him considerable literature describing gas producers and was told to take the literature home and study it, and that he would be expected to be making gas the next day. Well, his real trouble had just begun.

These gas producers were shaped somewhat like an inverted pear. The top had a hopper effect. Slides were placed near the bottoms which were pulled out periodically to admit coal from the hoppers. The coal used was a semi-anthracite. The hoppers had tight covers to prevent air getting into the producer gas. Poke holes were in the hopper covers to permit inserting rods to poke down the coal into the burning area. If small amounts of air were permitted to enter through the poke holes, the producers would backfire and all the ovens would be shut down. The gas was forced through a scrubber into the ovens by a large blower. The scrubber did not remove the tarry matter, consequently the pipes became clotted, gas could not be forced to the ovens, and ovens had to be shut down.

During electrical storms, the fuses would be blown; the blower would stop, the gas would backfire, break the water seal and blow water over the one end of the building and alley to height of 30 feet. This again would shut down all the enamel machines. Later this trouble was relieved to some degree by erecting 8" purge pipes vertically at the sides of the producers with a 90° angle extending from the pipe to and

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inside the gas producer near the top. These purge pipes were equipped with tight dampers. When a fuse would be blown, men would quickly climb on the roof, open the damper, relieve the internal pressure and prevent backfires and breaking of water seals. The company started to use City Gas in 1917 and discontinued the operation of the gas producers. Mr. Scott entered military service in 1917 and returned from service in 1919, as a sergeant of the 830th Squadron in the Air Force.

The gas from the producers was very irregular. It would burn vigorously on one side of an oven while on the other side there would be only a lazy flame. Many gas leaks occurred; the operators would check leaks in the pits by sniffing. Before they realized it, some had sniffed too much gas, became groggy and had to be taken outside and walked around until they were revived. On two occasions they thought the men were goners and that they would not be able to revive them. Such occasions happened in zero weather. On occasions, Mr. Rea would come in the enamel room to aid in operating and separating wires.

Mr. Clyde Emerick, who is working for the Rea Magnet Wire Company at present, started with Dudlo in 1915 or 1916. Con Voss and Frank Cronkhite were shift foreman and Dave Voss was in charge of the Enamel Department.

Norman George, at present President of the P.D.George Co. in St. Louis, was a young man and was employed during 1915 in the Enamel Department. He used a container with which he

kept going from one oven to the other and poured enamel in enamel in the pans to keep them at the proper level. After he had been employed for sometime, he approached Mr. Jacobs and asked for a raise. It was declined; thereupon he got up his dander and quit in an unhappy mood.

During the formative years, Dudlo did not draw the bare copper wire for their use, but bought it from the Rome Wire Company in Rome, New York. From 1914 to 1917 wire drawing equipment was installed and operated to a small degree. By 1917 new buildings had been erected and the business had increased and wire drawing was increased to provide sufficent bare wire for their needs. During World War I, the Dudlo was largely devoted to the manufacture of very fine enameled wire and coils for radio apparatus, X-ray machines, telephones, signal devices, ignition for army trucks, airplanes, and various other products for the Allied governments. Katherine Wafer, who is at present with the Rea Magnet Wire Company, was employed by Dudlo in 1919 to do clerical work and deliver mail. Later on her duties demanded inspecting bare wire. The wire mill floor was like a frog pond. Every day Katherine would have to wear rubber boots to inspect the bare wire running on the drawing machines.

The business greatly increased until 1921 when seven hundred employees were in service of the company; in 1922 there were 1650; in 1923 there were 1,950; and in December of 1924 there were 3,330 men and women employed. By 1929 the

employment was as high as 6,500 employees. While furnishing an enormous number of coils to the Ford Motor Company, they demanded two sources of supply. To meet the condition an enameling division was operated in Peru, Indiana. A coil division was operated in New Haven, Indiana. The building in Peru was started by C. V. Scott who is now employed by Rea Magnet Wire Company as Plant Engineer. It had been a brick horse barn. Mr. Scott returned from military service in the middle of 1919 and in 1920 was sent to Peru to get the building in shape for enameling. The building was approximately 40' x 60' and had a wing attached of about the same dimensions. One end of the building had horse stalls, while the other end contained the grain for feeding. Twenty-four ovens were installed and operated intermittently. The ovens were operated all told only about six months. Some ovens consisted of sixteen wires and some of thirty-two wires, double bank. In 1923 the ovens and the entire plant were dismantled and brought back to Fort Wayne. About forty people were employed in Peru. No wire was drawn in this plant; it was supplied by the Fort Wayne plant. Dale Siefred was employed as an operator in Peru, came to Fort Wayne in 1923, and continued with Dudlo until after it was moved to Rome, New York, after which he was employed by the Rea Magnet Wire Company and is still employed as a foreman in the enamel department.

The Dudlo plant produced 70% of all the Magnet Wire used in the world. In fact, at one time, it was estimated as high

as 80% of the world consumption. The plant operated 995 fine wire drawing machines and over 700 enamel ovens. The gas consumed was equal to that used by a city having a population of 125,000 persons.

In 1923 the name Dudlo Manufacturing Company was changed to the name of Dudlo Manufacturing Corporation.

On December 20, 1924, an "Old Timer's Banquet" was given at the Anthony Hotel ballroom to do honor to Mr. Jacobs. Over 250 Dudlo co-operatives were present. At the conclusion of a delicious dinner, a beautiful Gruen watch was presented to Mr. Jacobs by Mr. Victor F. Rea, who was then General Superintendent of the plant. The watch was a gift from Dudlo employees who had been with the firm five years or more. At the conclusion, boxes of chocolates were passed to the ladies present and cigars to the men. The whole affair was arranged as a surprise to Mr. Jacobs. Mr. W. C. Glass, Master Mechanic, was given a Shrine ring.

During the program Mr. Rea gave a talk on "You can't Guess the Half of It". Mr. Jacobs, then General Manager, gave a talk on "Where do We Go from Here?".

On November 15, 1927, the Dudlo Manufacturing Corporation was dissolved and merged with the General Cable Corporation. At the time of the dissolution, the Dudlo Manufacturing Corporation had a capital stock of 10,000 shares of preferred and 149,940 of common stock. The financial consideration for Dudlo plant was approximately $12,000,000.00 The capitalization

of the General Cable Corporation was approximately $60,000,000.00.

After the merger, the magnet wire business continued to thrive and expand until the depression, October 29, 1929. From November 15, 1927 to October 29, 1929, new buildings were erected and employment rose to over 6,500 employees. After the merger, the personnel, complexion and the policies of the organization changed and Mr. Jacobs became discontented, disgusted, and unhappy. An individual by the name of Procter D. Rensenhouse, who was imported from one of the banks in Chicago, greatly criticized the personnel, policies and operations of the plant. He created many enemies and an ill-feeling among the personnel and employees. His actions, principles, and derogatory criticisms in a large measure precedented the shutting down of the Fort Wayne Plant in February, 1933, and the laying off of a large number of the old Dudlo employees.

Whatever business survived or remained, was moved to the Rome Plant in New York. Thus ended the Dudlo Manufacturing Corporation of Fort Wayne; a noble, useful, successful, and monumental industry.

Mr. Jacobs, not willing to be subjected to despotism and witness unfair criticism and unkind treatment of his former faithful employees, severed his connections with the Corporation in 1928. Mr. Victor F. Rea was then appointed Works Manager, and Mr. Wendell C. Glass was appointed Superintendent of the plant. Mr. Rea continued as Works Manager with the corporation until August 1932; Mr. Glass continued as Superintendent until

the early part of 1929.

Magnet Wire was an obsession with Mr. Jacobs, and he was not the type of person to sit around and twiddle his thumbs and not do something about it. Before leaving the General Cable Corporation, he and Mr. Glass made a trip to Rome, New York, to advise the officers of the corporation that they were anticipating starting a new Magnet Wire plant. This resulted in a stormy session, and the officers tried to persuade them not to start a new plant, and finally one of gentlemen (Fuller) stated "Let Them Start A New Plant; When they Have it Running, We Will Buy it From Them". It was thought that they would have trouble competing with so large and well established magnet wire organization.

On July 30,1929, Mr. Jacobs and Mr. Glass incorporated the Inca Manufacturing Company and filed papers accordingly. They were joined by Miss Angela Baltes, Harry Byers, and Allan Jacobs, Nephew of Mr. Jacobs and other "Old Timers" from the Dudlo Manufacturing Corporation.

Due to Mr.Jacobs popularity among the Magnet Wire consumers, his reputation, his honesty and sincerity, and the unfriendly attitude of buyers toward the General Cable Corporation, the Inca Manufacturing Corporation was able to acquire more orders than they could fill. They erected a building and had the first oven running by October, 1929. Mr. Jacobs remained active in this field with the Inca Corporation during the early 1930's, then due to his wife's ill health, he moved to

California. His death occurred August 29, 1945.

It has been previously mentioned that Mr.Victor F. Rea, as Works Manager, severed his connections with the General Cable Corporation in August, 1932. From August, 1932, to January 1, 1933, Mr. Rea took an extended and well-earned vacation. He needed some form of recreation and relaxation after the unpleasant happenings and events of the last few years. Prior to leaving the General Cable plant, the writer very firmly emphasized to him that a small Magnet Wire plant could succeed and the time was ripe for such an adventure.

During the months of leisure, Magnet Wire was not one of the things that was remote from his mind. He kept abreast of the potential possibilities in relation to Magnet Wire.

In consequence of events, Mr. Rea, Mr. Edward Snyder, and the writer started plans for a new Magnet Wire Company on January 1, 1933. Mr. Rea had a den in his residence at 2445 Fairfield Avenue. It was here that we worked everyday and many nights on plans, designs, drawings, and financial problems concerning the new venture. When driving over to the Rea residence, in the mornings or noons, we would go by round-about routes. We parked our cars at various spots so that our activities would be shrouded. Cars were never parked near the residence. Individuals were curious and suspicious of some new enterprise being borne. In fact, some persons tried to shadow our cars. We were aware of these actions and kept some of the curious guessing.

During the months between January 1, 1933, and June, 1933,

we had many problems. We had machine parts made in out of city areas. We assembled the parts and tried them out. Some were failures in the sense that we were not satisfied with the results or convinced that improvements could not be made. New ideas would be conceived and tried until a point of perfection was reached that convinced us that we had something worthwhile and could proceed to incorporate the features in our designs.

One of the serious drawbacks in producing fine enameled wire was to run the wires at a definite and constant linear speed through the ovens. This feature we felt was never satisfactorily accomplished in the General Cable Plant. To us it was important, for it was our aim to produce the best fine enameled wire in the world. We felt if we could combine such a mechanical device with many of the other conceptions we had in mind, it would be far reaching in the industry, and enhance the quality of the wire we could supply. Dimensions of many detailed parts were very important and critical and had to be worked out with a great deal of precision. Our ovens were not a copy of someone else's ovens; therefore, again we had to use great caution in the analysis of our theories and applications; we could not afford to fail.

The container for handling wire has always been a problem. The standard container has been a spool or reel of some description. The spools had to be designed according to the lengths of wire that could be produced of a given size, capacity, weight, and the acceptance of them to the trade. The type of

spool was given very serious thought; we experimented with different materials and designs. We finally invented a one-piece aluminum die-cast spool. This spool made a superior looking package, offered less resistance to inertia, was very acceptable to the trade, and was patented. It was the only one-piece aluminum die-cast spool in the industry. The competitors were taken by surprise and tried to make its equivalent but did not succeed. Finally four or more competitors infringed on the spool or patent, but no action was taken against them by the Rea Magnet Wire Company. Competitors also bought the spools from our clients and used them extensively in their own plants.

It will be recalled that during the first half of 1933, we were still in the depression and the Bank Holiday had been declared--thanks to Franklin D. Roosevelt. The freezing of money created a very delicate and financial problem for us. We and others were unable to pry loose enough capital to make us feel certain that we could get the company started. Uncertainty persisted until June, but in the meantime, we did not cease working on our project. Coupled with our problems were forces working against us, by trying to point out that there was already a great deal of idle equipment for making Magnet Wire, and by making more equipment available would intensify the plight Magnet Wire producers were in.

During the early half of 1933, our President, Samuel A. Rea, was in his Junior year attending South Side High. Fortunately

Ed Snyder, Victor F. Rea, Jay F. Boeshore

Taken at Lake Leelanau - July 1, 1933

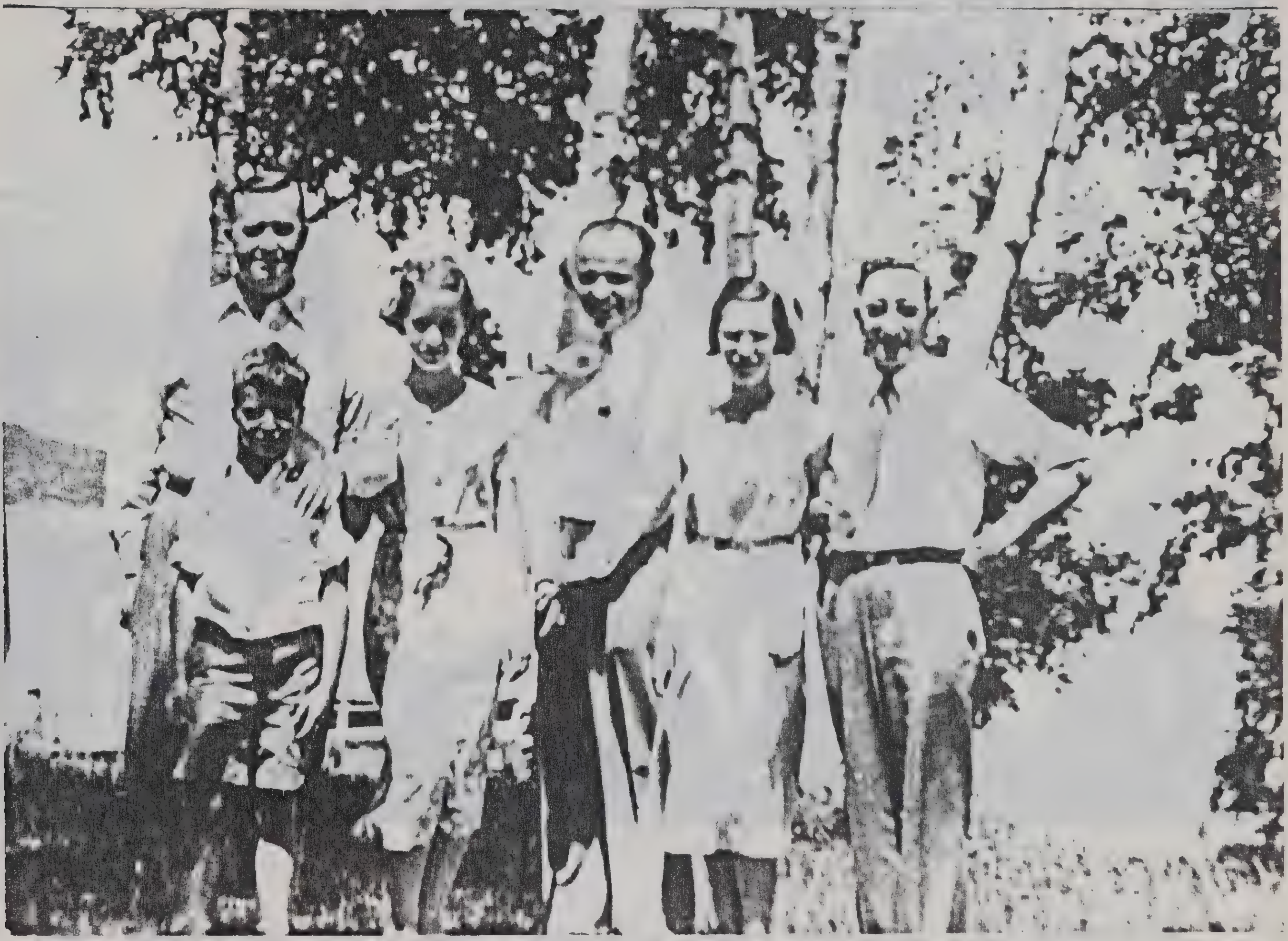
[illegible]

[illegible]

for him he came home everyday at 11 a.m. and proceeded immediately to play the same tune on the piano, - if it could be called such. It was a one-two finger jobby. The piano was adjacent to our work room; needless to say, the musical strains were not conducive to our work. The maid was an ardent soul. Each morning she had to vacuum the floor and the noise it made. One of Ed Snyder's pet peeves was a vacuum sweeper and this was all he needed. He darn near went berserk while the writer giggled. When all the occupants of the house were gone, the maid would enjoy baking ginger bread for us which we enjoyed and on some occasions we had butter put on our noses. Mr. Rea's sister, Miss Jane Rea, who was visiting, enjoyed the tete-a-tete.

Mr. David Rea, one of our present Vice Presidents, furnished the amusement. He was then about 10 years old. He loved to get his cronies or enemies together and put on a good mud fight in the rear of the premises. These instances took our minds and our eyes off our work.

While Mr. Snyder and the writer worked on the designs and drawings, Mr. Rea made his contacts among his trusted friends with the object in mind to ascertain whether they would be interested in investing money in the new industry. Some of the contacts were very negative believing that it would not succeed; some were willing to invest in a small way in order not to offend Mr. Rea or lose his friendship; some were willing to invest in the confidence, integrity, and knowledge that Dudlo was very successful. Those that invested, did not take much of a gamble.



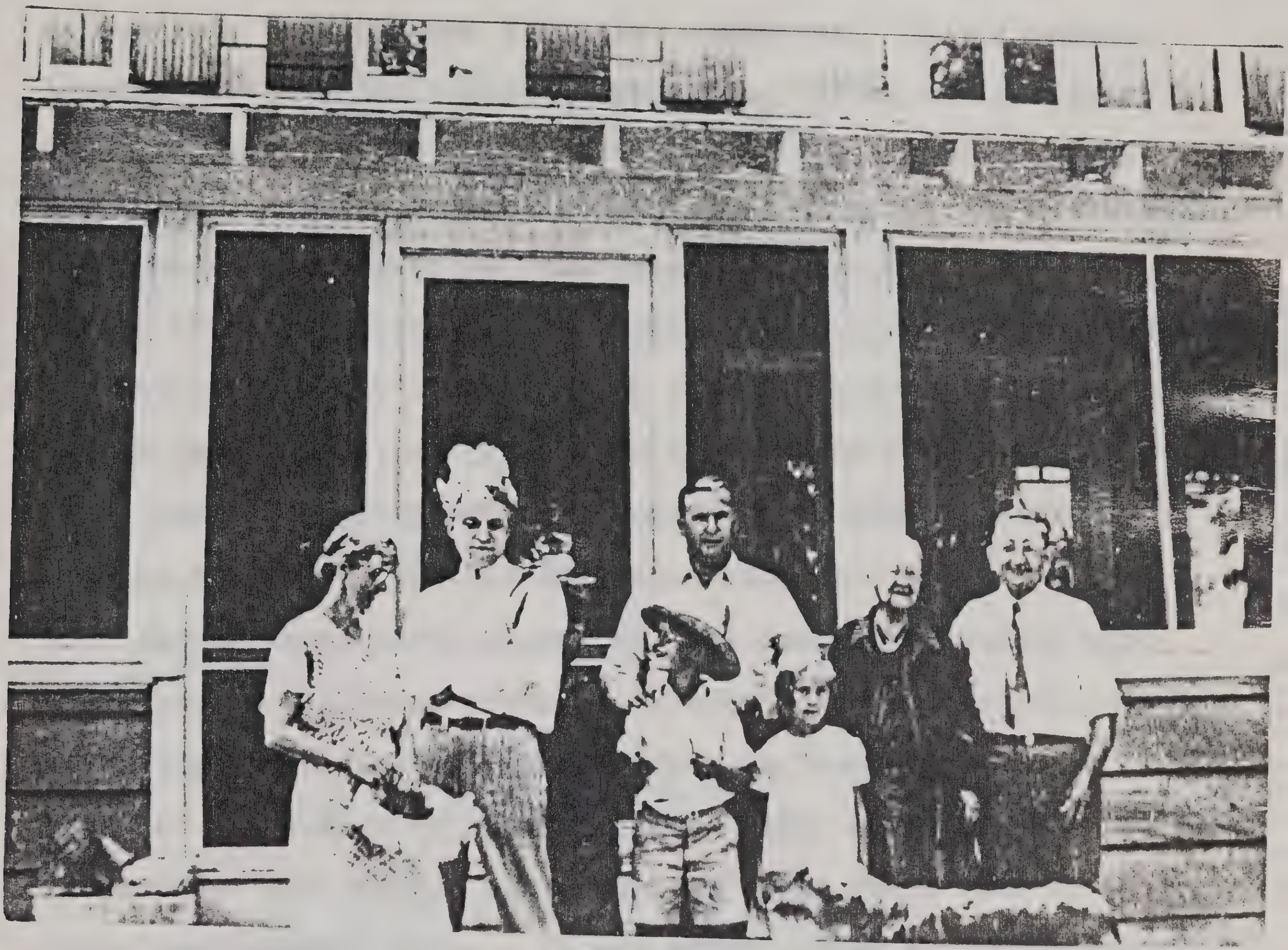
Victor F. Rea, Sally Rea, Ed Snyder, Mary McAnlis and J.F.Boeshore
David Rea

Taken at Lake Leelanau - July 1, 1933

Back Row -
Mrs. Braddock, Sally Rea, Lois Rea, Mary McAnlis, Jay Boeshore, Ed Snyder and Mrs. Minnie Boeshore

Front Row -
David Rea, Victor F. Rea, Mrs. Rhoda B. Rea, Janet Rea

Taken at Lake Leelanau - July 1, 1933



Mrs. Rhoda B. Rea, Ed Snyder, Victor F. Rea, Mrs.Braddock, and
David Rea Janet Rea (J. F. Boeshore

Taken July 1, 1933, at Lake Leelanau

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[illegible]

It remained for the three of us to acquire as much money as possible from our own financial resources. This involved loaning against life insurance policies, taking out mortgages on our homes, loaning against stocks and bonds that we might have owned. Such stocks or bonds had to be given for collateral. The bankers and insurance companies were cagey and timid about making loans on mortgages and stocks. The value of properties was then only about 1/4 or 1/3 of what it is today and due to the depression, mortgages were kept low on properties. These conditions further handicapped our problems. We had to make sacrifices and had to gamble with destiny.

During these early months Mr. Rea contacted trusted wire consumers in different areas to ascertain their attitude relative to buying a satisfactory product from an independent small producer. A number of consumers were quite agreeable to the proposition and assured him that they would route some of their requirements to us. It was known, after we incorporated, that we would have no Coil Winding Department. It was thought a Magnet Wire concern could not exist without a Coil Winding Department to salvage and use the unsalable wire. This was further evidence for the critics that we could not exist very long. Their crystal ball must have been as dirty as themselves. We fooled them, by-heck, thank the Lord and pass the ammunition.

On Friday, June 22, 1933, the three Muskateers proceeded to Mr. Arthur Parry's office in the Standard Building on East Berry St., and signed the necessary papers for incorporating

the Rea Magnet Wire Company, Inc. The following Saturday morning was also spent in Mr. Parry's office. At 11:30 a.m. we were free and directly hopped into Mr. Rea's Packard car and proceeded to his cottage at Lake Leelanau, Michigan, a trip of 330 miles.

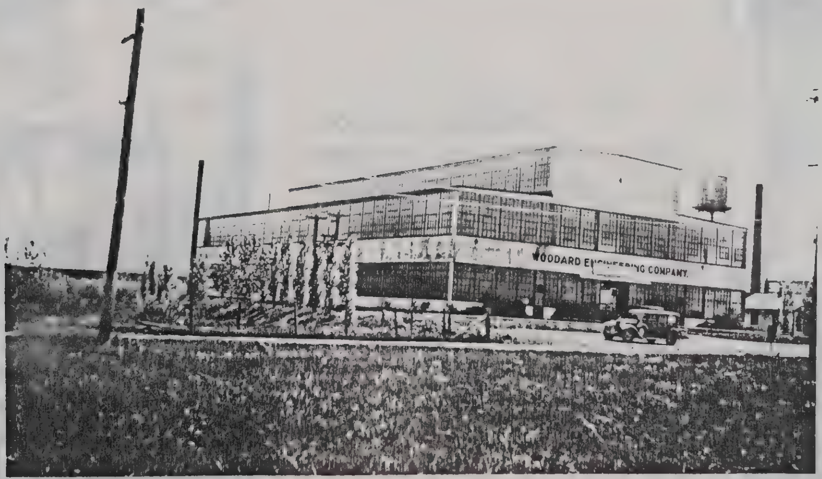
Many of the old Dudlo employees were unemployed due to the shut down of the General Cable Corporation's plant and were seeking employment; there were no unemployment benefits; scrip benefits were given for a short period. Due to these conditions, we realized that as soon as the notice would appear in the newspapers, we would be confronted by many persons applying for employment. By going to the lake we were beyond reach for the moment.

The following notice appeared in the newspapers:

> "NEW INDUSTRY NAMES HEADS"
>
> Victor F. Rea, President and A. H. Perfect, Vice President of Concern to Manufacture Magnet Wire
>
> Officers and Directors of the Rea Magnet Wire Company, Inc. were named at a meeting of the Company's Incorporators, held Friday afternoon.
>
> Mr. Victor F. Rea, former General Manger of the Dudlo Plant of the General Cable Corporation, was elected President and General Manager of the new firm. Arthur H. Perfect, President of the A. H. Perfect & Company, was named Vice President, and Jay F. Boeshore was elected Secretary and Treasurer. The officers were elected by the Board of Directors,

Original Building - 1933
(Notice sign "Bankrupt Sale")

Original Building - 1933
(View from Northwest)



Original Building - 1933
(View from Northeast)

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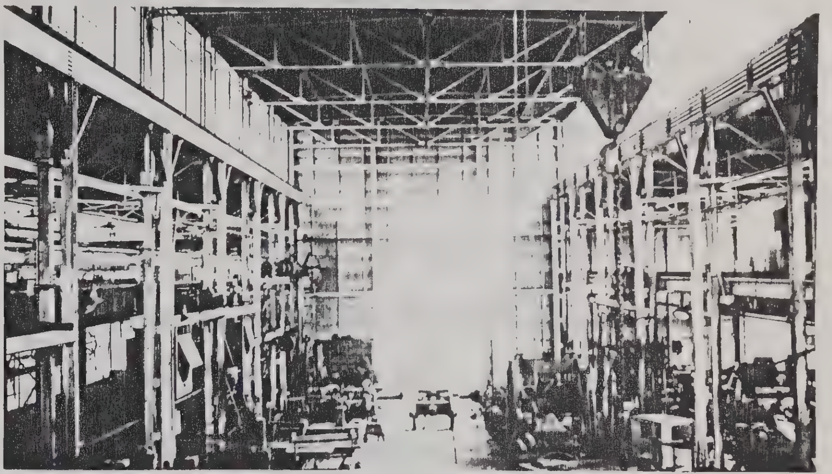
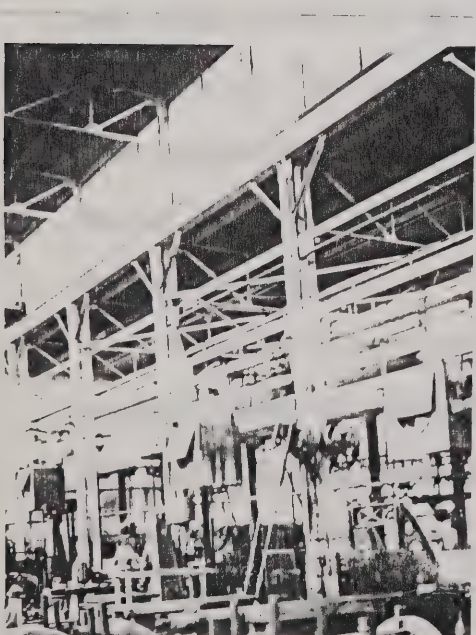
Rear of Original Building - 1933

(Boiler room on right corner.)

Looking south inside original building - 1933. Notice inside railroad track.

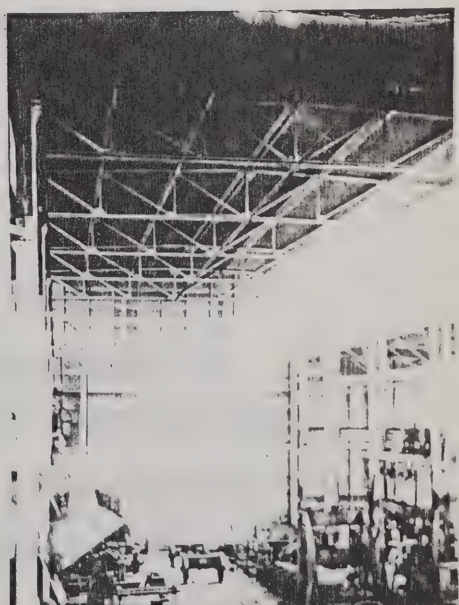




of

<- Inside or original building 1933. Showing Woodard Engineering's heavy machinery.

Looking south, inside original building - 1933. ->



which is comprised of Mr. Rea, Mr. Perfect, Mr. Boeshore, Wayne L. Thieme, and Edward Snyder. No decision was reached on the site of the new factory, although several locations were given consideration. The number of workers to be employed will be announced soon, Mr. Rea stated".

On the Wednesday, June 20th, preceeding the filing of papers of incorporation, Mr. Rea's family and Mrs. Boeshore drove to the lake at Leland. On the way to Grand Rapids the generator burned out and they had to remain in the city several hours until the necessary repairs were made. On the way home from the lake, Mr. Rea, Mr. Snyder, and Mr. & Mrs. Boeshore were traveling in one car when the condenser on the Packard failed about thirty miles northwest of Cadillac. They had to be towed to Cadillac by a small Ford roadster for repairs and replacement. We were unable to leave Cadillac until 10:00 p.m. We got to Kalamazoo about 1:00 a.m., had coffee and sandwiches, and then proceeded home. We arrived in Fort Wayne at 5:00 a.m. We were very tired and it was a trip that we never forgot.

One of the first requirements on our program was the acquisition of capital. The Company was catitalized for $90,000.00 and nine hundred shares of Capital Preferred Shares were issued, bearing six per cent interest, accumulative, with each preferred share five shares of Common Capital Stock, no par value, were given as a bonus. Accordingly forty-five

Original Building in 1936

hundred shares of Common Capital Stock were issued. During the fall of 1933 only a portion of the money was called. The stock was not widely distributed and was held by only fourteen stockholders. The Preferred Capital Stock was called in at $105.00 per share in July 15, 1950. During the life of the Preferred Capital Stock, quarterly interest payments were never missed, after the first interest payment was made August 11, 1934, dividends on Common Shares were first paid on October 15, 1934, and we never failed to pay a quarterly dividend thereafter: amount paid was 30 cents per shares. The first money called was June 30, 1933, payable on July 8, 1933; 20% of money subscribed was called.

After returning to Fort Wayne we had to decide on a location for the new plant; not many buildings suitable were available. The Woodward Engineering building came nearest to meeting our requirements and was rented from the Greater Fort Wayne Development Organization. There was only one building, 100' x 160', on the property. The building, property, and railroad siding were in a terrible condition. It had not been occupied for four to five years and the only occupants were rats and sparrows; they had taken over! The building contained 6600 windows and many of the panes were broken. There were very few facilities for heating; the sides of the building were metal panels, not insulated, and we darn near froze during the winter months.

The Woodward Engineering Company built special heavy machines. They failed during the depression, because they

did not demand down payments as the special machinery was being built. When the depression hit, their clients refused to pay to complete the machines, or for the work that had already been completed. The expenditure was more than the Woodward Engineering Company could carry; bankruptcy was inevitable. When the plant was shut down the heavy equipment remained just as it was left.

Since it was our thinking that we would operate only as a small plant with no more than six or eight ovens, we found that we had ample space in only half of the building. Therefore we rented the entire building for $500.00 per month from the Fort Wayne Greater Development Company and subleased half of the building at $200.00 per month to the creditors of the Woodward Engineering Company until such time as they required to dispose of the heavy equipment.

In our lease we had an option or stipulation to buy the property if we so chose, for $25,000.00, and any rent we had paid up to the purchase date would be applied against the purchase price. The property was bought on July 31, 1935.

As we had anticipated, we were beseeched for employment by many former Dudlo employees. Applicants would be parked on the writer's front porch mornings before he was out of bed; also at lunch time and after supper, besides appointments over the telephone. A sign had to be posted on the factory lawn "No Help Wanted, No Applications Taken", in order to reserve our time for other duties.

Before proceeding further, a biography of Mr. Victor F. Rea should be made a part of this history and will be given below:

Mr. Victor F. Rea was born in Frankfort, Kentucky, May 24, 1889. His father was Samuel Rea, who was in the linen manufacturing business and his mother, before her marriage, was Martha Clark. Business opportunities took the family to Dudley, Massachusetts, when Victor was an infant. He grew to manhood there and gained his early education in the public schools of that city. His first employment was in the linen trade but electricity, then a growing science with marvelous utility more and more apparent, had a strong attraction for him and he studied the subject with an eager desire to master its problems from the commercial side. In 1910 he joined Mr. Jacobs in Cleveland in the new Dudlo. They probably became associated due to the fact that both lived in Dudley, Massachusetts, and both had lived and attended public shools. Some fifteen months after coming to Cleveland, the plant was moved to Fort Wayne and Mr. Rea became a resident and citizen of Fort Wayne.

Mr. Rea grew up with the vast business and became General Superintendent and Works Manager of the Dudlo Manufacturing Corp. He won these executive charges because he was able to produce results in factory management. He watched the payroll expand from ten to over 6,500 employees. He also witnessed sales developed from a few thousand dollars a year to over two

million dollars per month. At a conservative estimate, the institution which he helped to build, added a population of 25,000 to the city of Fort Wayne.

Mr. Rea took an active part in the city progress and in campaigns waged to improve living conditions, advantages, or the physical aspect of the city. He served as a team worker in the annual Community Center drives, and was a team worker in the Y.M.C.A. Enlargement Fund Drive of 1925.

During the World War, Mr. Rea assisted in making the Liberty Loan and Red Cross Drives successes, and also kept the plant production up to the peak point, which the needs of the government demanded.

Mr. Rea was a member of the Chamber of Commerce, and was connected with its Industrial Bureau. He was a member of the Quest Club, the YMCA, the Fortnightly Club, Orchard Ridge Country Club, and the Fort Wayne Art School and Museum.

He married Miss Rhoda E. Braddock, daughter of N. A. and Sarah Braddock, at Tawas City, Michigan, December 25, 1916. Mr. & Mrs. Rea had five children: Samuel Arthur, Rhoda Ruth, Lois, David Warren, and Janet Rea. The family wer members of the Plymouth Congregational Church.

Mrs. Rhoda E. Rea died September 29, 1948. Mr. Rea died August 21, 1954.

After we got into the Woodward Engineering Building, the first duties were to get it cleaned up. Dirt and dust were all over the plant from top to bottom and over all idle equipment.

Office facilities were poor and filthy. All of us aided in cleaning and trying to get an agreeable working area. The rats and mice had nests and filth everywhere. At the end of the day we looked like coal miners and stank like turkey buzzards. We had no lawn, only a bunch of tall weeds in front of the building. Due to the many window panes broken, we could not replace them fast enough, so in the meantime, we got many a shot from the dear sparrows; noses, bald heads, and girls were not exempt. The rats we could not easily destroy on account of all the heavy machinery, they had too many places to hide and breed; neither birds nor rats practiced birth control. Young pre-feathered birds fell out of crane pulleys and other suspended parts. Pre-haired mice were found in the most obscure spots. Juvenile specimens loved to explore the insides of your sleeves when you reached on shelves or ledges for anything. The adults would seek the warm spots and pilfer for food. To say the least, the place was deplorable.

Mr. C. V. Scott was the first employee. His starting rate was 30 cents per hour with no overtime or holiday rate. His first duties were to cut the weeds in front of the building and to make a path to the front door. Thereafter, cleaning was the main job for months, since equipment had to be built or bought before operations could be started. Mr. Scott started to work on July 17, 1933. Our first stenographer and bookkeeper was Miss Dorothy Hart. She also started to work on July 17, 1933. She had been Mr. Rea's private secretary while he was with the General Cable Corporation; she started

at the rate of $15.00 per week for a 45 to 50 hour week. Not one office girl was hired for less than $15.00 per week, nor one factory girl under 35 cents per hour. The normal rates for factory girls during these years were as low as 17 to 18 cents per hour. No overtime rates, and no paid vacations or other benefits were paid. The People's Bank and the Lincoln Bank were chosen by the Directors.

From our designs and drawings we had to make detailed drawings to enable us to order the machine parts, patterns, and castings.

The first ovens were ordered and built by Young Brothers of Detroit, Michigan, and cost $630.00. Mr. Rea had to make several trips to Detroit to discuss our oven theories and to describe our requirements. Mr. Rea and the writer spent several days in Waterbury, Connecticut, to inspect the Waterbury Farrel drawing machines and their operation, after which we ordered our first machine which cost $1730.00 Recently they quoted us for the same machine approximately $6650.00. Promissory notes were signed by Mr. Rea and the writer for the early drawing machines.

Recently, for the same type of 8 foot ovens, $3350.00 was quoted. From the cost of the two types of equipment, it can be seen how prices and costs have changed.

The first oven built was #17 and is still standing on the same spot. We could produce wire from this oven, but it was a far cry from being satisfactory to us. It had to be

re-vamped and re-cut a number of times before we were ready to proceed with other ovens.

Harry Marchand, a foreman, who is still with Rea Magnet Wire, started work at 2 p.m. on September 30, 1933, at 40 cents per hour. The first wire run was #38. We experimented with the oven for about one month. In our original design, we did not anticipate running wire as fine as #40 (.003"). Sizes #30 (.010") to #38 (.004") was supposed to be the range. The machines are now equipped to run up to #50 (.001"). On October 1, 1933, Frank Femion, a foreman still with Rea Magnet Wire, was hired and George Price, still with Rea Wire was hired on October 5, 1933, to assist Harry Marchand to run the one oven. At the end of 1933, we had 3 ovens.

The first drawing machine was received and run prior to September 30, 1933. It was set up close to the enamel oven and run by the writer. The machine was studied and changes were made to make it more efficient for our work. # 40 (.003") wire was run at six thousand feet per minute, but at this speed more breaks occurred and the maintenance of the machine ran too high. The first process spools were zinc die-cast made by the Schutz Die Casting Company of Toledo. The first shipping spools were made by the Alemite Die Casting Company of Woodstock, Illinois. The 4-1/2" spool castings cost us 9 cents to 10 cents each which are now 50 cents. The 6" spool die-castings cost us 17 cents to 21 cents which are now 85 to 90 cents. The dies cost us $500.00 to $750.00 which are

now $7000.00 to $7500.00 each. The first dies were hot-shot multiple cavity dies, while today they are cold-shot single cavity dies.

We bought our copper in the form of #14 (.064") annealed in coil form. We bought a second hand horizontal drawing mill for drawing the #14 for fine wire stock. The mill cost us a little more than $1000.00. After we scrapped this mill, about twelve years ago, it was purchased by the Imperial Wire Company.

Mr. Grover Siler, general foreman, retired, was hired July 24, 1933; Mr. Harry Wyland, retired, was hired September 18, 1933; and Mr. Edward Cameron, Wire Mill, Foreman was hired October 13, 1933. These latter men were hired for wire drawing and doing other chores. Miss Catherine Wafer, forelady, was hired as an inspector October 16, 1933. She is still employed by the Rea Magnet Wire Company.

The first order, received in October, 1933, was from the Jefferson Electric Company for 10,000 pounds of #38 Enameled wire on 3" spools. We were so elated we looked and looked at the order and pawed it around; we could not believe we had received our first order. We did not know whether to fill it or frame it. The writer packed and shipped the first orders. The weighing was done on a small platform scale. The early wire was very satisfactory to those to whom shipments were made; softness, uniformity of color, uniformity of overall dimensions, and continuity of coating were recognized. These

qualities were at once appreciated because it made more uniform coils, fewer rejects, and a lowering of costs. It also promoted requests for more Rea wire; it boosted their piece work rates. Jefferson Electric Company reported to us a saving of as high as 37% in winding coils of Rea wire.

We worked many long days. Mr. Rea and the writer remained in the plant until 1:00 a.m. to 3:00 p.m.; 11:00 p.m. to 12:00 p.m. was common. We never got away at the end of the day including Saturdays and Sundays. We had poor ventilation. Our noses ran and our eyes teared and we stank to the high heavens of enamel fumes. We avoided outside persons or gatherings because of the odor. No - the birds did not respect us either! During the first years all of the enamel was mixed by hand by the writer in a sixty gallon cylindrical tank, mounted on a wooden table approximately 30" high. A 150 gallon cylindrical tank was lowered in the floor as a circulating tank. The enamel from the mixing tank was dripped into the circulating tank by gravity. We did not pay ourselves any salary until close to the year end of 1933, at which time we went on the payroll at $25.00 per week.

By the end of 1933 we had thirty-nine employees. We gave each employee a live turkey. These were distributed according to the size of the family of the employee. The first live turkeys were bought at Kingston, Indiana, which is about twenty miles south of Fort Wayne. Frank Fremion had an old pickup truck without a top. We took several doors off

the stock rooms and placed them over the truck and drove to Kingston for the turkeys. It was a cold snowy day. We wanted live turkeys because we knew the employees would have trouble taking them home. Not every employee had a car, so they had to travel on the streetcar and not every turkey was housebroke! It was something they never forgot, especially the girls, and we had lots of fun talking about it.

After the turkeys arrived at the plant, we tied each one to a #8 sash cord and strung them on the floor several feet apart. Each turkey had some employee's name on it, with some remark or incident that happened to the employee during the year. There were some pretty red faces. Mr. C. V. Scott was master of cermonies and Santa Claus. We had popcorn and crackerjack for the children under 12 years of age. The wives and children were invited to the occasion. We had a Tom weighing 25#for Mr. Rea, and how the Rea kids loved to pet that live turkey. Three of the Rea children were over 12 years of age, but we could not keep them from the popcorn and the crackerjack. C. V. Scott as Santa, had quite a time getting away from them; they followed him everywhere he went - - finally as a last resort, he got up along the wall on a crane track, and worked his way into the boiler room in the basement, so they would not know that he was a real guy and not Santa Claus with popcorn ballast. These proceedings were a little unusual and the writer expected to be reprimanded by Mr. Rea, but he entered into the frolic and enjoyed it.

Mr. Rea's turkey plus a few others were taken to the boiler room and given a New York dressing.

The first 16 employees hired during 1933 were:

	DATE HIRED
V. F. Rea, Deceased	June 27, 1933
Edward Snyder, Deceased	June 27, 1933
Jay F. Boeshore, Retired	June 27, 1933
C. V. Scott, Still Employed	July 17, 1933
Dorothy Hart, Deceased	July 17, 1933
Grover Siler, Retired	July 24, 1933
Wilford Anderson,	July 25, 1933
Harry Pattee, Still Employed	July 25, 1933
William Roemke, Still Employed	July 31, 1933
Carl Hanna, Retired	Sept. 14, 1933
Harry Wyland, Retired	Sept. 18, 1933
Harry Marschand, Still Employed	Sept. 30, 1933
George Price, Still Employed	Oct. 1, 1933
Frank Fremion, Still Employed	Oct. 5, 1933
Edward Cameron, Still Employed	Oct. 13, 1933
Catherine Wafer, Still Employed	Oct. 16, 1933
Paul Bechtol, Still Employed	Oct. 19, 1933
Edward Sorg, Deceased	Oct. 24, 1933

For the years 1933, 1934, 1935, 1936, at Christmas time we bought live turkeys. The number bought for each year was as follows:

	Total Weight	Price/Pound
1933 - 39 Turkeys		
1934 - 70 Turkeys	992	28 1/2¢
1935 - 111 Turkeys	1305	28 1/2¢
1936 - 149 Turkeys	1794	21¢

At Christmas time in 1936, the employees presented to Mr. and Mrs. Rea a beautiful Stromberg Carlson radio for their 20th wedding anniversary. Mr. C. V. Scott made the presentation which was made on the second floor of Building #3. The cost of the radio was over $300.00. The gift was a surprise to Mr. and Mrs. Rea.

In 1937, we presented turkeys to those only who had worked during 1937 six months or more. There were 22 such employees. The turkeys were dressed and bought from the Poultry Shop in Fort Wayne. The price paid for the fully dressed turkeys was 33 cents per pound.

The older employees, for Christmas, each got a General Household Utilities radio. Many of these radios are still in operation. We bought 139 radios at $15.82 each. Those not having six months service during 1937 got neither radios nor turkeys. Ernest Thomas, a deaf-mute, was also given a radio, we having forgot that he was deaf. Well, we had red faces, but he was able to sell the radio and we felt happier about the incident. Before the presentation of the radio to Mr. and Mrs. Rea, the employees sang "Jingle Bells".

Jingle Bells, Jingle Bells, Jingle all the Way
Oh! What fun it is to ride in a one horse open Sleigh,
Jingle Bells, Jingle Bells, Jingle all the Way
Oh! What fun it is to work for our good friend Mr. Rea!

For 1938 Christmas we bought 132 fully dressed turkeys at 30 cents per pound. Total cost was $590.54. This was the first year we had a Christmas program. The building in which it was held was #5 in the northeast corner adjacent to the old boiler room. The boiler room was then under Ovens 49, 50, 55, 56. Mr. Oscar Harnish was a colored man "Sam" and acted as Master of Ceremonies. A fireplace was erected with a fire glowing in it. A radio was on the mantle and candles were on either side.

Mr. C. V. Scott took the part of an old man and conducted a dialogue with Earl Walker. A floodlight was thrown on the scene and photos were taken by Mr. Harnish's son. Mr. Edward Cameron, a Scotchman, played the part of Santa Claus and sang "Oh! It's Nice to Get Up in The Morning, But it's Nicer to Stay in Your Bed". Oscar Harnish sang, "Silent Night" in German and a mouth harp solo was played by Herschel Swank. An accordian solo was played by Betty Fremion. A cornstalk duet was played by Ed Sorg and Ernest Thomas and a solo was sung by Mart Roebble. A talk was given by Mr. Rea.

In 1939 we presented 180 New York dressed turkeys bought from the Central Grocery, price 29 cents per pound, weight 2283 lbs., cost $662.00.

The party was again held in Building #5. Some of the numbers sung were "Silent Night", "Santa Claus is Coming to Town", and "Santa Claus Express". Eleanor Cupp Barclay gave a song and roller skating specialty. The orchestra consisted of Bing Weller, Walt Bonham, Charlie John, Buell Romine, Bob Geller, and Wilber Faulkner. Mr. Scott acted as "Uncle Joe" and was Master of Ceremonies. We borrowed 100 chairs from the Trinity Lutheran Church and the piano was borrowed from Jess Miller.

In 1940 we presented 203 turkeys, New York dressed. We paid 25 cents per pound live weight, and 25 cents additional for dressing. This year we had our first party away from the plant. It was held at the Catholic Community Center. The program was presented by the employees. Mr. Oscar Harnish sang "Old Black Joe" and Bonnie Kaade sang "God Bless America". C. V. Scott (Uncle Joe), was Master of Ceremonies.

A talk was given by Mr. Rea. Candy was furnished for the children. Ed Cameron was Santa Claus. Apples, oranges, balloons, and Mickey Mouse Cookies were also given to the children. Employees contributed 25 cents each for candy, etc. Dancing followed the program. We paid $65.00 for the use of the auditorium.

During 1941 employment increased and 225 turkeys, oven dressed, were distributed among the employees. We paid 32 cents per pound, live weight, and 50 cents additional for oven dressed.

The Christmas party was held at the Valencia Gardens.

The rental fee was $50.00. The children were given animal crackers and Mickey Mouse crackers. A program was rendered. Mr. Oscar Harnish was Master of Ceremonies. Photos were taken by Andy Haudenschild and Mr. Harnish's son. Charlie John, Walt Bonham, and Buell Romine furnished music from 7:30 to 8:00 p.m. Orlia Maggert, banjo, and Rowland Hisner, guitar, played a duet. Eleanor Cupp Barclay did some tap dancing. Outside talent put on a floor show.

Joe Grable as Major Puffle, was elected to make a presentation. It was Mr. & Mrs. V. Rea's 25th Wedding Anniversary, and a beautiful sterling silver tea service set was presented to them.

In 1942, employment dropped due to war, and only 187 turkeys were distributed to the employees. Prices for oven dressed turkeys were 45 cents per pound. Total paid $1155.04. This year the Christmas party was held at the Chamber of Commerce. The entire program was furnished by Dorothy Durbin's Central Artists Bureau.

1943 was a war year and employment had been increased, 233 turkeys were distributed. Price paid was 62 cents per pound, plus 20 cents additional for each turkey for placing them in individual boxes.

1944 was the last year that turkeys were distributed. Every year there was a lot of grief connected with giving turkeys. During the years 1944, 1945, 1946, 1947, and 1948, the Christmas parties were held at the Chamber of Commerce.

All programs were staged by outside talent. Dancing followed each party.

1945 was the first year turkey certificates were given at Christmas time to the employees. The certificates had a value of $8.00, and the custom has been practiced every year since 1945. The method has worked out very well. We paid $50.00 rental fee and $220.00 for entertainment at the Chamber of Commerce.

During the Christmas party at the Chamber of Commerce in 1947, we were severely criticised by members of the Chamber of Commerce. Some of our employees bought considerable liquor to the party and it caused some unpleasant incidents. After this year and every year thereafter, a policeman was hired to keep everybody in line. This was the first year attendance prizes were given.

In 1948, Mr. C. V. Scott, as Santa Claus, gave a talk to the children and introduced Walt Bonham who in turn turned the program over to Mr. Gale York of the York Theatrical Company of Fort Wayne. After the drawing for the attendance prizes, dancing followed; music was furnished by the Woody Neff Orchestra. In 1949 the Christmas party was held at the Purdue Extension Building. Since then, and up to the present time, the parties have been held in the Fort Wayne Armory.

As mentioned earlier there was only one building, 100' x 160' on the property when bought in 1935. As we expanded,

Woodward Engineering equipment had to be sold or moved out of the building. There was, and still is, a 5-ton overhead crane in the building, which made it very convenient to erect our ovens. It was felt that it was a valuable piece of equipment and the cost was low, but Mr. Rea had to be tricked into buying it, it never had to be regretted.

In the original building, there was office space in the northeast and northwest corners. The space was connected by an overhead balcony about 5' wide along the north wall. The offices that now exist in this area were built: 7-1941. The office furniture and safes were bought second hand for approximately $500.00, and most of it is in use to this day. The various buildings were built in the following order:

1 - 7/31/35 - Original Building
2 - 12/31/36 - Enamel Circulating Room
3 - 8/31/36 - West Addition to #1
4 - 6/30/38 - Garage
5 - 11/16/39 - Addition South of #1
6 - 3/30/40 -
7 - 1942 - Enamel Room South of #5
8 - 8/24/43 - Enamel Storage Room
9 - 12/20/43 - Addition West of #5 and #18
10 - 1943 - Guard House
11 - Aug.45 - Shust Ware House
12 - May/51 - East Wire Mill Bldg.
13 - 8/4/48 - Wire Mill & Boiler Room
14 - 10/6/48 - Rod Storage

15 - Feb.49 - Formvar Storage Bldg.
16 - Dec.48 - Butler Ware House
17 - July/50 - East Office Building
18 - 3/26/53 - Heavy Enamel Wire Bldg.(Originally #6 & #7)
19 - - None Assigned
20 - 5/1/51 - Hosiery Bldg.
21 - 5/1/51 - Garage
22 - 5/53 - Shipping Dock
23 - 12/53 - Breezeway

During the war on the location of # 9 Building, a temporary building was built of wooden auto cases and was used several years for shipping and as a finished stock room.

The Gotham Hosiery Building was acquired on May 1, 1951, immediately after Mr. Rea's Mediterranean Cruise; in fact it was arranged to buy the building the same day Mr. Rea returned. He was taken from the train directly to the office.

At the end of each year since 1933, we had the following number of enamel ovens:

1933 - 3
1934 - 13
1935 - 21
1936 - 33
1937 - 41
1938 - 42
1939 - 43
1940 - 46
1941 - 53
1942 - 53
1943 - 54
1944 - 55
1945 - 56
1946 - 64
1947 - 77
1948 - 83
1949 - 83
1950 - 90

1951 - 91
1952 - 94
1953 - 109
1954 - 112
1955 - 126

At the end of each year since 1933, we had the following number of fine wire drawing machines:

1933 - 5
1934 - 11
1935 - 13
1936 - 22
1937 - 28
1938 - 28
1939 - 28
1940 - 32
1941 - 32
1942 - 32
1943 - 32
1944 - 32
1945 - 32
1946 - 32
1947 - 39
1948 - 50
1949 - 50
1950 - 50
1951 - 50
1952 - 52
1953 - 60
1954 - 60
1955 - 65

At the end of each year since 1933, we had the following number of intermediate machines:

1933 - 00
1934 - 00
1935 - 1
1936 - 3
1937 - 4
1938 - 4
1939 - 5
1940 - 7
1941 - 8
1942 - 9
1943 - 11
1944 - 11

1945 - 12
1946 - 15
1947 - 21
1948 - 23
1949 - 23
1950 - 25
1951 - 25
1952 - 27
1953 - 29
1954 - 29
1955 - 29

November 15, 1933, we put into operation one #3 - 8 die tandem heavy drawing machine. This machine was bought second hand and was scrapped in 1945.

February 28, 1934, a tandem medium heavy wire drawing machine was put into operation. This machine was scrapped November 30,1941.

Both of the afore mentioned machines were of the horizontal type and were obsolete when bought second hand.

No.1 - nine die rod machine was bought in 1939
No.2 - ten die rod machine was bought in 1947
No.1 - Annealing Oven was bought 2/2/40
No.2 - Annealing Oven was bought 12/11/47
No.3 - Annealing Oven was bought 6/15/51
No.4 - Annealing Oven was bought 5/1/55

No. 1 - Fabric Machine - American Insulating Machine Co. -7/20/38
No. 2 - Serving Mach. - Rea Type 27 -6/20/39
No. 3 - Serving Mach. - Rea Type 27 -11/20/42
No. 4 - Serving Mach. - Rea Type 27 -12/2/48

The seven residences on Pontiac Street directly north of Rea Magnet Wire's buildings were acquired in 1951 and the four lots at the corner of Pontiac and Holly Streets in 1953.

These properties were bought to give greater protection to the plant.

The north wall of the original building was improved with a brick facing in 1950.

The Group and Life Insurance was purchased for the employees on December 1, 1946.

The Hospitalization Insurance was purchased for the employees March 1, 1947, and the plan was revised for greater benefits October 1, 1953.

The Pension Plan was purchased November 1, 1950

Profit Sharing was inaugurated December, 1934.

A fixed profit sharing plan was started in 1954.

The first factory girls Christmas party was held in 1933 and has been held every year since with the exception of 1952.

From the time the company started to the present time, we have had the following deaths:

Otto Smith	3/30/41	Plane Accident
Henry Wiedelman	6/14/42	Heart Disease
Claude Haines	9/22/44	Throat Operation
Ed Sorg	12/28/44	Stroke
Ludwig West	1/5/45	Pneumonia
Frederick Chenneour	2/2/45	Heart Disease
Ed Snyder	6/14/45	Heart Attack
J. Leland Green	5/25/46	Motorcycle Accident
Gerald Farries	8/ 27/46	Brights Disease
Clarence Richey	11/14/48	Cancer--Liver

Melvin Abbott	3/29/49	Committed Suicide
Roman Sorg	3/14/50	Heart Attack
Paul Steffen	3/14/50	Committed Suicide
Harry Kinsman	4/13/51	Uremic Poisoning
William Jacoby	12/20/51	Heart Ailment
Victor F. Rea	8/21/54	Coronary Thrombosis
Ora Fell	10/2/55	Leukemia

Otto Smith, our first death, was killed in a plane accident in Berne. He was of the dare-devil type and the accident occurred during one of his stunts. The wife had been a former Rea employee and their child was born just a few months prior to his death. He was a cousin of Art Smith, the well-known Fort Wayne aviator.

We had 61 employees in the Second World War, three were killed in action. They were: Dale Baumgartner, brother-in-law of Otto Smith, Arthur Miesen, and Phillip Harvey.

After War II and the Korean War, we had 33 men in service. One employee, George Lee, was killed in action.

One of our men, Russell Pugh, still employed by Rea Magnet Wire Company, was the first U. S. soldier to land on the island of New Guinea. The first death benefit was paid to Mrs. Otto Smith. Mr. Rea and the writer personally drove to Berne and presented the first check to his widow.

Our first softball team was organized in 1939. The members of the team were:

Walter Sprunger
Charles Morrison
Otto Smith, Deceased
Del Young

Lawrence Sigler
Pete Piepenprink
Don Sparks
Don Baker, Deceased
Russel Sherman
Albert Kieler
Bob Geller
Walt Bonham
Norman Potts
Elton Springer
Howard High
Del Hurddle

Walt Bonham was captain of the team and they won in this year, the YMCA championship. Eight of the members are still working at Rea's. Softball championships won were:

1939 Y.M.C.A. Industrial & City Leagues
1940 Y.M.C.A. Industrial & City Leagues
1941 Sappenfield League
1942 Sappenfield League
1949 Y.M.C.A. Play-off Champs
1950 Y.M.C.A. Industrial League and Play-off
1951 Y.M.C.A. Industrial League
1954 Y.M.C.A. Industrial League & Play-off

The first basketball team was organized in 1939. The members were:

Dale Hamilton
Howard High
Del Young
Howard Hall
Louden Hoover
Walt Bonham
Elton Springer
Otto Smith
Wallace Bartels
Russell Platt
Fred Moser
Jim Glass
Bob Bolyard
Ross Leaky
Wilbur Bell

Eight members of the team are still employed at Rea Magnet Wire Company. The feature game of the season and league was on January 24, 1940, - Rea vs. Tokheim - triple

overtime - Rea 34, Tokheim 32.

Championships were won in the following years:

1939-40 . . . . 2nd half Champs
1940-41 . . . . Industrial League Champs
1941-42 . . . . 1st half Champs

Also winners in Independent Tourney 1941.

The first bowling team was organized in Sept.-1952.

The first airplane was bought by the company in 1951.

The number of employees at the end of each year:

1933	39	1945	264
1934	70	1946	296
1935	107	1947	365
1936	145	1948	361
1937	102	1949	333
1938	129	1950	390
1939	176	1951	383
1940	196	1952	387
1941	221	1953	431
1942	189	1954	443
1943	245	1955	490
1944	238		

While synthetic resins were developed and made during World I, they were not used in formulations for wire coatings. They were, however, used in varnishes but were unstable to some degree. The aging was retarded if the varnishes were put under refrigeration until used; the resins in the solid state also aged. Accelerators were used that continued the breaking down of the molecules, liberating ammonia. In the

early 1920's, the resin manufacturers made rapid progress, but it was not until the late 1920's that formulations were made using mixtures of natural copals and modified phenolic resins. Continued progress was also made in the technique of processing wood oil. The new formulations were used to some extent, but did not replace the oil basis-wire-enamels, due to their excellent dielectric properties.

The conventional oil basis enamels are being used up to the present time, but had to be improved in quality and application to keep pace with the synthetic enamels that were undergoing developments. During 1936 to 1955, many oil basis and synthetic enamels were tried and evaluated by the Rea Magnet Wire Company, but few were suitable for the electrical trade. Some had superior advantages in some respects that could be used in limited applications only.

Glytol varnishes were made during the early 1930's and were very satisfactory for many applications other than wire coatings. Eventually prior to 1938, a Glyptol Wire Enamel was made and applied as a wire coating. Considerable wire was made with it. Motors were wound and sold. The product did not prove satisfactory, motors were returned and the experiment was costly.

During the glyptol period the Permanent Magnet Metal came into prominence and was going to be used in all Ford cars, farm sets, etc. The "calamity howlers" were busy and predicted Magnet Wire was doomed, and for sometime Rea Magnet

Wire Company felt uneasy, but again the quality control and cost of the PM metals were not properly evaluated and black enameled wire kept on the carch.

In about 1938 the excellent properties of polyvinyl acetal, as an insulating material, had been noticed. By experimentation, it was found that by combining an aldehyde and a vinyl alcohol, a suitable resin could be obtained for wire enamel. Formaldehyde and polyvinyl alcohol were used and obtained polyvinyl formal. This product was given the name of Formvar and the General Electric Company obtained a series of patents covering its use as an insulating film for Magnet Wire. Many problems remained to make the resin practicable in the wire field. Many improvements were brought about by the combined efforts of varnish makers, Magnet Wire Manufacturers, and copper suppliers.

One of the main differences between the natural enamels and formvar is that the wood-oil enamels dry by oxidation; oxygen is required to form an insulating film; the drying of the formvar film results uniquely from the nature of the molecules by condensation, or polymerization. During the early years of formvar, its dielectric and some other properties were not outstanding. It did possess toughness and high abrasion resistance. To overcome weaknesses of formvar, multiple coats had to be applied. These were for the purpose of producing high coatings and a finished wire more nearly round. Very little wire was produced and sold as single

formvar; it was definitely a low dielectric Magnet Wire. However, as we got into the Second World War, space factors became important; many applications were a onetime purpose and extremely fast baking varnishes were used, plus less experienced operators in the winding field.

It seemed apparent that the General Electric Company had a great deal of influence in the field and in Washington. The feeling was brought about that formvar was a "cure-all" or panacea for the Magnet Wire consumers. The result of all this caused very many of the government contracts to demand formvar wire where conventional wire might have been better and cheaper. These contracts and influences created a very large demand and very greatly promoted the use of formvar wire, which was down General Electric's alley, because they collected a royalty for every pound sold, and selling or granting licenses to produce the wire. Due to labor shortages, Rooseveltisms, curb sitters, union practices, etc., the wire consumers had to scrape the bottom of the barrel to get some resemblances to human beings to operate their machines. This resulted in a low standard of labor, but formvar wire could be horsed around to a greater extent than any other wire produced up to this time. It made possible operating at higher speeds, tolerating smaller radii and applying faster and more vicious thinners in the impregnating varnishes.

Formvar wire as it existed during the 1940's, had very low water resistance, and if stretched by a few percent, its

dielectric strength was lowered very much. Its dielectric strength varied from day to day depending on atmospheric conditions. On humid days the voltage breakdown was very low. Armatures wound with wire produced on high humidity days resulted in many failures. The General Electric Company must have been cognizant of this condition, but there would have been a negative reaction to their best interests if this feature had been made known.

The application of Formvar-Enamel required a new technique. Prior to Formvar-Enamel, practically all enameled magnet wire was made by what is known as the "dip" method, The oil-based enamels contained 40 to 50% solids with low viscosity, plus good adherence to copper. Formvar-Enamel on the other hand possesses a very high viscosity, with a low percentage of solids. These solids in spite of high concentration may be as low as 10%, yet having a viscosity of 9000 centipoises. The low concentrations of formvar necessitates the addition of other synthetic resins in order to increase the low solids content. Some resins are also added to alter and increase the quality of formvar.

The formvar resin itself would not be sufficient to produce a good Magnet Wire enamel. Additive resins, such as thermohardening resins are used, thus a better surface hardness, abrasion and solvent resistance, as well as heat resistance, can be achieved. During the years many formulations have been tried and used. Every Formvar-Enamel Manufacturer has his own trade secrets, and there are still considerable variances

in the quality and performance of the formvar enamels from the different sources. It is well known that additions of complimentary resins must be made to meet the demands of the trade, which seem to change from year to year. The demands appear to go in cycles; sometimes it is moisture resistance, sometimes increase in voltage breakdown per mil, sometimes abrasion resistance, low solderability or high hermetic qualities and resistance to Freon F-22, although many functions are not understood.

Due to Formvar-Enamel's high viscosity and extremely low flowing properties, it must be applied with dies. Dies can be of different designs, but they serve the purpose of a metering and wiping device; they also permit the wire being run at a higher speed than could be run otherwise. Formvar-Enamels have heat or baking limitations and consequently, the medium and heavy sizes of wire are pre-annealled before entering the baking ovens. This has the disadvantage of demanding a greater outlay of capital per enamel unit.

During the early and middle 1940's formvar was not used to a great extent for coating the finer sizes of wire. The technique had not been sufficiently developed for this purpose. An important step in the progress of Formvar Wire was made by the copper suppliers in that they produced bars and rods of superior surface qualities. Copper bars are being scalped and copper rods are being shaved. These operations eliminated many surface imperfections, such as fins, overfills, and barbs and result in higher dielectric and smoother wire. Most of the formvar wire made today is

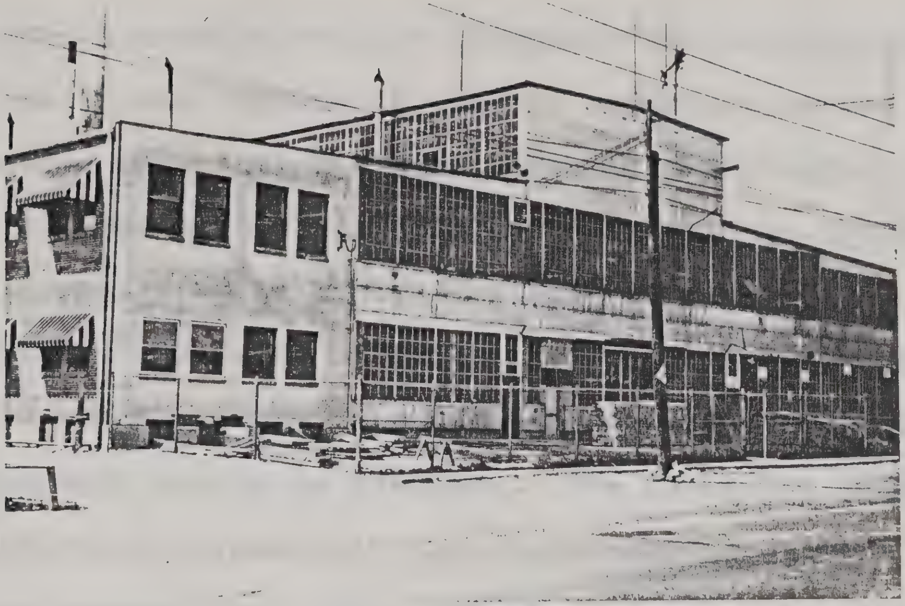
made from shaved rods. Ordinary copper rods are used mostly for conventional enamel wire, but could also be improved by using shaved rods.

Copper suppliers have also contributed to the advantage of the Magnet Wire consumers by developing and supplying Oxygen Free High Conductivity copper (O.F.H.O.). In the early formulations of Formvar-Enamel high percentages of cresylic acid and furfural were used. The cresylic acid caused a great deal of dermatitis on the hands of the operators. In fact, some operators could not continue as formvar wire operators. Furfural caused staining of the skin and headaches. Letters were sent out to formvar enamel users to convince them that furfural was not injurious to health. The first Formvar-Enamels could not be run in steel or galvanized pans; nor could cast iron sheaves or galvanized piping be used, Bronze, tinned, or chrome plated surfaces had to be used. The dies also wore very fast due to the corrosive effect. The Furfural aged rapidly, the resins bodied and aged also if not used up promptly after injected into a system. These latter faults have been greatly improved or eliminated. The aging of formvar wire under heat has been improved; also the adherence of the film to the conductor. Formvar wire still has a tendency under heat to lose some of the insulating qualities. Formvar wire has a disturbing property that when it is placed in a cold solvent, especially when the film is under mechanical strain, will develop crazing (fine cracks).

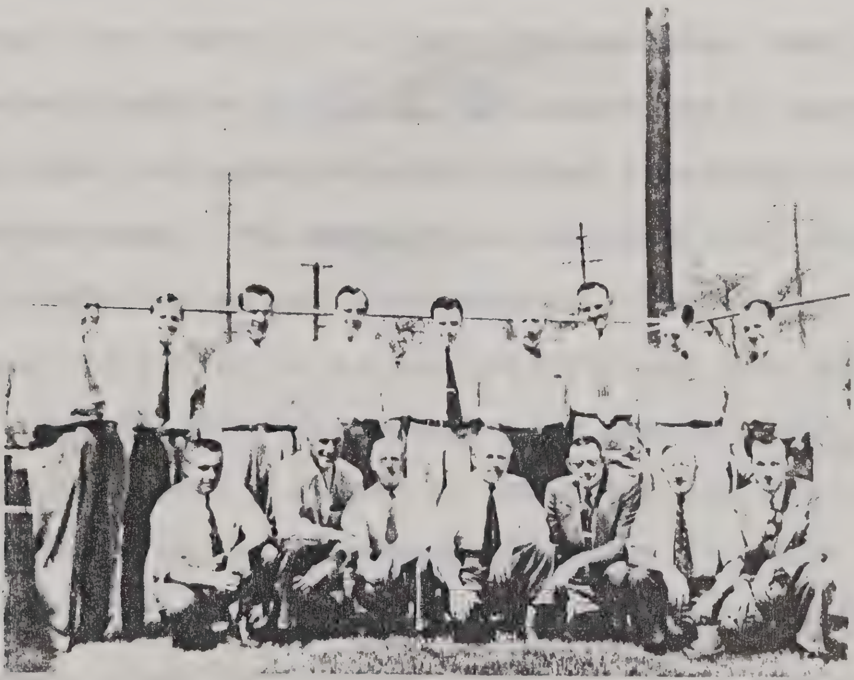
Mr. Victor F. Rea

1954

[illegible]



East Office Addition in 1950



Salesmen in 1953

First Row - Left to right--Dave Rea, E. B. Henderson, John Muddle, R. L. Whearley, M. E. Knutson, Jay Boeshore, and Leonard Mayeron.

Second Row - Left to right-- V.F.Rea, Sam Rea, John Frederick, Al Sheldon, Leonard Oser, O. J. Lenmark, Ivan Barclay, Robert Slater, and N. H. Budde.

These cracks seem to heal or disappear when subjected to heat, but is not dependable, due to variation in the baking temperature and other factors. Crazing may reappear in coils placed in storage and for this reason should be impregnated, but this proved to be wishful thinking.

The ups and downs of formvar wire has caused many a headache but the above is sufficent to convey some of the features that had to be overcome. The foregoing lengthy description of formvar wire has been written because it has replaced conventional black enameled wire to a much greater extent than any other synthetic coating. Today it can be employed to insulate the heaviest sizes through the entire range to .0007" wire.

Through the years it has been demonstrated that a new coating should not be placed on the market until thoroughly tried and aged, but manufacturers become impatient and have regrets afterwards. The properties and qualities cannot be thoroughly established and confirmed in laboratories. The product must be proven in actual practice and time must be involved. Due to lack of thorough time testing, and actual practical evaluation, a number of synthetic coatings have become available to the consumers of Magnet Wire and have been used in small quantities for some certain or limited applications. Such innovations create a lot of gossip but gradually fade away.

Rea Magnet Wire was rather timid in entering the formvar wire picture up to 1942. While the quality was not what it should have been at the beginning of World War II, a great demand was developed due to General Electric's influence in government contracts or sub-contracts. It became imperative that the Company prepare itself to produce formvar wire. The Company had obtained a license to make and sell formvar wire, together with an agreement that the General Electric Company would supply the necessary know-how and demonstrate the making of formvar wire.

In March of 1942, Messrs. Snyder, Chenneour, and the writer made a trip to Schenectady, New York, to acquire sufficient information for producing formvar wire, but we were disappointed and had not accumulated much information. It was realized that the Company had to use its own ingenuity. To begin with the General Electirc Company's representatives in Schenectady, were close-fisted in giving information and their equipment was designed strictly for making formvar wire. They were more than willing to build and sell machines to us, but their delivery dates were 15 to 18 months and the cost was beyond what the machines were worth. Since their machines were of the horizontal type and ours of the vertical type, the demonstration was of little value.

Our big problem was to try to produce fine wire on the vertical machines, and this was not a soft nut to crack. Needless to say, we started a series of experiments and little

by little the process was developed until we were able to produce Formvar wire equal to the best. By May of 1942, we were able to produce small quantities. During World War II there were terrific demands for conventional black enamel. The consequence was that we progressed slowly into the Formvar wire field, but emphasized quality.

It should be mentioned that through the years, manufacturerers had a great deal of trouble making satisfactory voice coils for radio speakers. The problem was brought to our attention in 1934, and through experimentation we were able to produce a special wire for this purpose, known in the trade as "Rea Special" or R.S. wire. The quality of this wire was not duplicated by any other competitor, and while it was used in small quantites, it often aided Rea Magnet Wire Company to acquire accounts that otherwise would have been hard to crack. This wire is still in demand for radio speakers.

Another synthetic enamel coating that became quite prominent in Nylon. This resin was introduced about the same time as the Formvar resin. Wire enamels were made from it and wire was produced an prematurely placed on the market which resulted in Nylon wire getting a black eye. During World War II, in 1942, Rea Magnet Wire made a considerable amount of #42 (.0025) Nylon magnet wire for headsets. The coils for this purpose were random wound; a very high quality wire was required and it had low solderability which was also very important.

During the 1940's, Nylon magnet wire's progress was slow, but during the latter years it has forged ahead, due to its low solderability. The basis of Nylon is adipic acid combined with diamine and condensed under heat. It has good elasticity, heat and abrasive resistance. Under humidity the dielectric drops very low, but this fault can be overcome if coils or motors are treated with impregnating varnishes. It is not as good as Formvar wire for very hot motors, or when exposed to sudden heat shock. For these reasons Formvar wire is preferred, unless there is a serious soldering problem.

Nylon wire has a lower co-efficient of friction than Formvar wire. This property of Nylon wire has been improved in the last few years. This feature of Nylon wire has been taken advantage of in the production of Nyclad wire, which is a combination of Formvar and Nylon. A low coated Formvar wire is coated with Nylon-Enamel and the resultant product is Nyclad wire. The dielectric value and abrasive resistance of Nyclad wire are not as high for Nyclad wire as for Formvar wire, but the windability is better, due to the lower co-efficient of friction. Consumers of the Nyclad wire report fewer rejects when using Nyclad wire than they suffer when using either straight formvar or Nylon wire. Rea Magnet Wire started making Nyclad wire March 6, 1954.

During World War II a very useful enamel coating was developed known as Teflon. This was a war baby and a top secret. It possesses many of the properties of Formvar but

is superior in heat aging; it can be operated continuously at considerably higher temperatures and has a very low co-efficient of friction. It has the disadvantage of producing an irregular surface, low surface continuity, and is very costly, therefore its use is restricted. Rea Magnet Wire has not produced any Teflon wire but minor experiments have been conducted with the basic material. Teflon is a tetrafluorethylene compound and in the presence of moisture can develop traces of hydrofluoric acid and should be used with due consideration given to its economic feasibility.

Silicone, Epoxy, Alkanese, Isonel, Thermoles, Dacron, and Isocynated Enamels section have been run by Rea Magnet Wire experimentally. The results obtained to date have not warranted rushing into the field.

During the 1940's, Rea Magnet Wire ran glass covered wire. It is useful where ther are serious moisture and heat problems. Its applications are limited and the Company discontinued its production until demands and applications have increased.

Television has created great demands for fine Magnet Wire, and a Formvar wire coated with a thermoplastic film. In this case the thermoplastic coating will soften under heat, but upon cooling will harden. This product is used to make coils of odd shapes that can be set before removing from the forming device.

The Rea Company has supplied the name of "Koilset" ,a thermo setting on surface of wire, to this product which was

placed on the market in 1954. There is a strong demand for the wire but the company's production facilities for making it are limited. Cellulose derivaties, polystyrene, vinylidene, methyl methacyiate can be used for thermoplastic applictions.

In the fall of 1954, the Company developed new shipping containers for Magnet Wire, in the form of 500# drums and 100# buckets. These were offered to the trade as non-returnable carriers for Magnet Wire. The packaging was introduced to the trade under the name of ReaPak.

The Company's operations over the years were confined mostly to the manufacture of Magnet Wire, with the exception of building some coil winding machines and furnishing valuable coil information to winders; many dereeling devices were built and sold to magnet wire consumers. The Company also designed and built a great deal of its manufacturing equipment. The expansion of the Company is reflected in its increase in tonnage and sales, as shown by increased equipment and employment during its 23 years existence. The Company has also tried to maintain very friendly relationships with its employees as well as with its clients, and it can safely be stated that these relationships were important factors in producing quality wire and promoting increased sales.

Mr. R. L. Whearley entered the employment of the Company in 1934, and was elected a Director, July 5, 1945, after the death of Ed Snyder. He was elected Vice President July 10,

1946, after the death of Mr. A. H. Perfect, and was elected Executive Vice President May 3, 1955. Mr. Chan Ray was elected as a Director September 27, 1946.

Mr. David W. Rea was hired and worked as a factory employee intermittently from June 24, 1946 to June 16, 1948, after which he attended Indiana University. He was elected as a Director May 11, 1950. He was elected Assistant Secretary August 26, 1954, and Secretary and Sales Manager September 27, 1954, and on May 3, 1955, he was elected Vice President in Charge of Sales.

Mr. Samuel A. Rea worked as a factory employee from June 13, 1938, until August 12, 1938, and again from June 17, 1940 to August 16, 1940. Sam attended the Wharton School of the University of Pennsylvania, and graduated in 1940, completing the course in Economics and Business Administration. In the fall of 1940, he entered the Yale Law School. After completing one year, he enlisted in the Navy, August, 1941, and remained in service until October, 1945.

He was elected Assistant Secretary and Treasurer August 17, 1949, and was made Director May 11, 1950. After the death of his father, Victor F. Rea, August 21, 1954, he was elected President - August 26, 1954. He was elected Treasurer September 27, 1954.

Mr. Allen C. Sheldon was employed as Assistant Superintendent on February 1, 1950. He was appointed Plant Manager on September 27, 1954, and was elected a Director, December 14,

1954. On May 3, 1955, he was elected Vice President in charge of Manufacturing.

Mr. Ira Belcher was elected Assistant Treasurer September 27, 1954, and Mr. George Cook was elected Assistant Secretary September 27, 1954.

Mr. Victor and Mrs. Walda Rea were on a European tour from April to August in 1954. They returned on August 9, 1954. On August 21, 1954, Mr. & Mrs. Rea drove to their cottage at Lake Leelanau, and while visiting with his entire family in the evening on this same date, he was stricken with a heart attack and passed away before medical aid could be summoned. Mr. Rea's death was a terrific shock to all his friends, associates, and employees. His presence will be missed for many, many years. As our "Boss" he was always friendly and courteous to everyone of his employees and his policy of fairness was respected by all. He always felt deeply grateful to everyone in his organization for contributing to making the Rea Company a success and an industrial plant that Fort Wayne could look to with pride. He contributed very generously to the advancement of the City of Fort Wayne, industrially and socially.

The writer was elected Vice President on September 27, 1954, and on February 7, 1955, was made an Honorary Vice President. He retired on March 1, 1955, at which time a beautiful RCA Color Television Set was given to him, together with one year's guaranteed service, by the Rea employees.

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This color set was the first color set installed in a Fort Wayne home. This gift was a great surprise to the writer, was very much appreciated, and great deal of pleasure is being derived from it. Many Fort Wayne citizens have seen color television for the first time on that set.

The manufacture of Magnet Wire has certainly exerted a great deal of influence on the growth and development of Fort Wayne. It influenced companies to locate plants in this city that might not have come otherwise, such as Essex Wire Company, Inca Division of Phelps Dodge Copper Products Corp., Imperial Wire Company, Wire Division of the General Electric, Coil Engineering of Roanoke, Ballastran Corp., Arco Company, Magnavox Company, Fort Wayne Wire Die Company, Indiana Wire Company, Luginbill Die Company, Ajax Industrial Suppliers, Inc., Detroit Wire Die Company, Hoosier Wire Die Company, Morrill Motors, Electric Motors & Specialties Company, and C. & W. Insulating Company.

It the total employment of these companies were known, it could readily be seen that it would be a large segment of the total employment of Fort Wayne. So, it must be evident that manufacture of Magnet Wire has influenced and benefited the community tremendously, and it can be prophesied that the community will continue to reap the benefits for many years from the efforts of the pioneers of the Magnet Wire Industry in the City of Fort Wayne.

Historical as of 6/1/55
Typed - January, 1956